Deanship of Graduate Studies
Al-Quds University

Data Mining in E-Government: Design of Palestinian E-Government and Identifying Suitable Mining Model

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M.Sc. Thesis

Jerusalem – Palestine
1432 / 2011

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1432 / 2011

A thesis Submitted in Partial fulfillment of requirements for the Master degree of Computer Science from Computer Science department of Al-Quds University

Jerusalem – Palestine
1432 / 2011

Al-Quds University
Deanship of Graduate Studies
Computer Science Department

Thesis Approval

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Jerusalem – Palestine

1432 / 2011

Dedication

To my parents, the reason of my existence,
To my real friends, the source of my happiness,
To my colleagues at Ministry of Finance and Al-Quds University
To the Palestinian National Authority

Kholoud Al-Tawil

Jerusalem - Palestine

1432 / 2011

Declaration

I certify that this thesis, submitted for the degree of Master, is the result of my own research, except where otherwise acknowledged, and that this thesis (or any part of the same) has not been submitted for any higher degree or to any other university or institution.

Signature

Kholoud Al-Tawil

Date: 29/03/2011

Acknowledgement

Praises and thanks always be to Allah, The creator, and The teacher.

Then, I would like first of all to present my greatest and deepest gratitude and appreciation to my supervisor Dr. Badie Sartawi for his great support, effort and advice during my study period and especially the course of special topics.

I am also so grateful to all teachers at Al-Quds University/Computer Science department. This thesis would not have been possible without their encouragement.

Lastly, and the most importantly, I wish to convey my sincere appreciation and thanks to my father, mother, friends, brothers and sisters, and I'd also like to offer special thanks to Mr. Majed Ayyad and Mr. Hossam Matter for their advice, and I am also thankful for anyone who helped me…

Kholoud Abed Halim Tawil

Abstract

E-government today constitutes the base through which the application and executing the government actions in the world. This depends on the rapid and the ongoing development and progress in the field of information and communication technology. So we have carried out a research study and through which the mechanism and the techniques being investigated as a foundation for constructing and designing the e-government environment, and through this research study we have demonstrated the reliable techniques and mechanisms to benefit from the accumulated government data.

Through this study we have carried out some modifications or additions apart from what we have demonstrated and introduced in the field of E-government to benefit and be adapted with the special situation concerning the subject matter. This subject matter that aims at constructing and designing model actions for the Palestinian E-government and defining the previously prepared model , and the used techniques in searching for the data in that of the government to obtain the required knowledge in the support of decision making and in politics.

To build the proposed model and design, a layer called E- rules layer was added, this layer represents the top power for the E-government and it supports the establishment of the Electronic government administration, this enables any government or non-government associations to refer to use and put all of the criteria required for the usage or application. The presence of this layer allows the identification and passing all the laws in relevance to the government performance and it contains the restriction and the limitations that concern each unit or government performance programs, this layer gives the government the ability for the protection and the confidentiality of the performance. It also sets the strategy required for application and it could be used in particular without any interference.

The work of this layer doesn't contradict the programs and applications previously used as a control unit had been setup, this unit modifies the variations and inconsistency in the data construction and the ways of processing the programs that is running it. This unit works as a mediator that concerns with the differences in the data framework construction and its running programs in case they are required, or in case of performance.

To pass the orders directed to the government from different sides, the mediator unit had been constructed in the model proposed to run, identify them and to control the mechanisms of their carrying out the mediator unit concerns orders processing and offering services required for being executed, in addition to control the safety and the accuracy and the correctness of the output.

To ensure the performance of all that, a set of required servers have been identified on the proposed model that works on executing and the application of working mechanism required, and to benefit from the government data the model proposed .

Health insurance for government employee a case study for the possibility of applying the model proposed, we find that this study produced and developed, and simple design for an e-government which contains the comprehensive central components to execute the E-government work, and to benefit from its data and it could be applied in the Palestinian government or any new grown-up government working environment suffering from arbitrary actions and being monotonous in using and applying its data.

الملخص

تشكل الحكومة الالكترونية اليوم الأساس الذي يتم من خلاله التطبيق والتنفيذ للإعمال الحكومية في العالم، وذلك بالاعتماد على التطور والتقدم السريع والمستمر في مجال تكنولوجيا المعلومات والاتصالات، لذا فإننا قمنا من خلال هذا البحث بدراسة الآليات والطرق التي بحثت وتم الاعتماد عليها في بناء وتصميم بيئة العمل للحكومة الالكترونية، كما وتم من خلال هذا البحث عرض الطرق والآليات التي يمكن تطبيقها للاستفادة من تراكم البيانات الحكومية.

وقد عملنا من خلال هذه الدراسة على التعديل أو الإضافة على ما تم عرضه وتقديمه في مجال الحكومة الالكترونية من الدراسات السابقة لملائمته وتكييفه مع الوضع الخاص لموضوع البحث والذي يهتم بإنشاء وتصميم نموذج عمل للحكومة الالكترونية الفلسطينية وتعريف النماذج المعدة والتقنيات المستخدمة في التنقيب عن البيانات في البيانات الحكومية للوصول إلى المعرفة اللازمة في دعم اتخاذ القرار والسياسة.

ولبناء النموذج والتصميم المقترح فقد تمت إضافة طبقة تسمى طبقة القواعد الالكترونية والتي تمثل السقف الأعلى للحكومة الالكترونية وتدعم التأسيس للحكم الالكتروني، و يمكن لأي جهة أو مؤسسة حكومية أو غير حكومية الرجوع إليها لاستخدام ووضع كل من المعايير اللازم تطبيقها أو استخدامها، كما ويسمح وجود هذه الطبقة لتعريف وتمرير جميع القوانين الخاصة بالعمل الحكومي، كما وتحتوي على القيود والمحددات التي تخص كل وحدة أو نظام عمل حكومي، وتعطي هذه الطبقة للحكومة القدرة على حماية وسرية العمل ووضع الإستراتجية اللازمة للتطبيق ولا يتعارض عمل هذه الطبقة مع ما تم إنشاءه أو استخدامه من أنظمة وتطبيقات سابقة حيث انه تم إنشاء الوحدة المسؤولة عن تحويل الاختلافات وعدم التوافق في تركيبة البيانات وطرق معالجتها والبرامج المشغلة لها، حيث تعمل هذه الوحدة كوسيط يهتم بمعالجة الاختلافات في تركيبة البيانات والأنظمة المشغلة لها عند الطلب والتنفيذ.

ولكي يتم تمرير الطلبات الموجهة للحكومة من الجهات المختلفة فقد تم إنشاء الوحدة الوسيطة في النموذج المقترح لإدارة الطلبات وتعريفها والسيطرة على آلية تنفيذها، حيث تهتم هذه الوحدة بمعالجة الطلبات وتقديم الخدمات اللازمة لتنفيذها ومراقبة سلامة ودقة النتائج وصحتها، ولضمان عمل ذلك كله فقد تم تعريف مجموعة الخوادم اللازمة على النموذج المقترح والتي تعمل لتنفيذ وتطبيق آلية العمل المطلوبة والاستفادة من البيانات الحكومية على النموذج المقترح.

وقد تم تناول التامين الصحي للموظف الحكومي كحالة دراسية لإمكانية تطبيق النموذج المقترح، ونجد أن هذه الدراسة استطاعت الخروج بتصميم ونموذج حكومة الكترونية محسن وبسيط يحتوي على المكونات الرئيسية الشاملة لتنفيذ العمل الحكومي الالكتروني والاستفادة من بياناته ويمكن استخدامه وتطبيقه في الحكومة الفلسطينية و في أي بيئة عمل حكومية ناشئة تعاني من العشوائية وعدم الرتابة في استخدام بياناتها وتطبيقاتها.

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Chapter One: Introduction

1.1 Introduction

E-Government is a new grand domain in recent years; it is an attempt to use technology to improve peoples' lives. UN believes that e-government can be a positive instrument for the national policy [1]. E-government uses information technology to provide better and faster online services and information to citizens, businesses and government. It also presents challenges and opportunities to transform both the operational process of government and the nature of governance itself, this government has the potential to positively change the way government operates and how citizens and businesses interact with government. Each government needs appropriate strategy planning in order to implement its e-government successfully [2].

Modern information and communication technologies enable service providers and users to observe and record individual's daily actions with relative ease. Giving the ability to construct detailed collections of information, users and providers hope to mine for patterns, models, and trends that will assist in the direction of knowledge which is dependent on services in various environments. In [3], technology of data mining is widely used in various fields which represent most recent daily applications, generating and collecting data that have been developing rapidly, organizations are searching for data mining techniques to

improve the efficiency and performance of the used applications. Data mining techniques have been developed and designed to search for valuable information in large volume of data, it is used to uncover useful patterns and relationships from the captured data.

Through the adoption of the proposed Palestinian e-government model in this research, the Palestinian e-government agency clearly identified the relationship with all other agencies, citizens, businesses, intermediate committees by a coherent and transparency relation. Agencies use technology to deliver services, provide information, interact and transact with people as they work to achieve the outcomes sought by government in transformation and integration manner. Our Palestinian situation encourages promoting the design of strategies which is more robust, because in our society there are widespread of uses of the information communication technology.

1.2 E-government

E-government means different things for different people. According to [4], e-government is closely linked and shares similar characteristics with the fields of e-commerce and e-business in terms of the use and implementation of internet technologies, re-engineering intra-organizational processes and structures, and generating new services products and channels for the end-users or consumers. Related to [2], all researchers agreed that e-government uses information technology to provide better and faster online services and information for citizens, businesses and employees by government. In [5], the target of e-government encompasses four main groups: citizens, businesses, governments and employees. The electronic transactions and interactions between government and each group constitute the e-government web of relationships and the respective four main forms that are: 1) Government to Citizens (G-to-C): deals with the relationship between government and citizens. E-government allows government agencies to talk, listen, relate and continuously communicate with its citizens to improve services. 2) Government to Business

(G-to-B): consists of the electronic interactions between government agencies and private businesses. 3) Government to Government (G-to-G): refers to the relationship between governmental organizations, as for example national, regional and local governmental organizations, or with other foreign government organizations. 4) Government to Employees (G-to-E): refers to the relationship between government and its employees.

In [2], lack of appropriate strategies and planning are some of the main challenges in e-government. E-government presents challenges and opportunities to transform both the operational process of government, and the nature of governance itself. Therefore, each government needs appropriate strategy and planning in order to implement its e-government successfully.

1.3 Data Mining

In [6], Data Mining or Knowledge Discovery (KDD) is the process of analyzing data from different perspectives and summarizing it into useful information. Data mining software is some analytical tools for analyzing data, it allows users to analyze data from many different dimensions or angles, categorize it, and summarize the relationships identified. Technically, data mining is the process of finding correlations or patterns among dozens of fields in large relational databases. Organizations are accumulating vast and growing amounts of data in different formats and different databases. The patterns, associations, and relationships can provide information; this information can be converted into knowledge about historical patterns and future trends. In [7], as in Figure (1.1), data mining process in database is often characterized as a multi stage iterative process which involves:

1. Creating a target data set: selecting a data set, retrieving the data from large database, and selecting the relevant subset on which the discovery is to be performed.
2. Data preprocessing: deciding on the appropriate sampling system, cleaning the data and dealing with missing fields and records.

3. Data reduction and projection: finding useful features to represent the data, depending on the goal of the task, and applying the appropriate transformation, dimensionality, reduction and projection.
4. Mining: choosing and running data mining algorithm on preprocessed data sets. For example, summarization, classification, clusters, and so on.
5. Evaluation: evaluating the quality of the output of data mining algorithm from step 4, both for the prediction and the interpretation of the fitted model.
6. Deploying: putting a model from a data mining algorithm into routine predictive use.

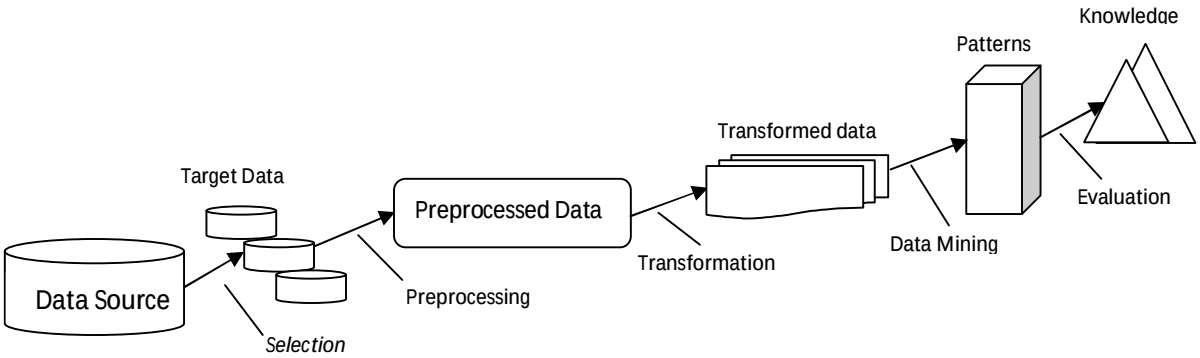

Figure (1.1): KDD Process in Database

Example: information that can be used to increase revenues in government. During the analysis of revenues transactions information, the government knows which revenues are increased and when. So, when something happened like tax that affects this increase, the government searches the reasons that affect it and what is affected. According to this information which includes historical patterns and future trends, the government can obtain the knowledge of how the suitable procedures or laws are applicable, will encourage paid revenues, and study the behavior conditions to improve the revenues.

1.4 Data Mining Applications

Data Mining has been successfully deployed in numerous application areas. It has become one of the most popular hypes for business world, although, researchers take always data mining as an interest area to search. They are always concerned about the ability of using

data mining in popular and important applications. In [8], the paper explores the possibility of using data mining in public organizations as a tool for improving their efficiency. It represents a survey on areas of data mining applications in the public organizations to which it presents. Finance and Economy had the largest number of applications at 29%, followed by Healthcare at 24%, Criminal Justice and Defense at 24%, Education at 9%, Labor & social welfare at 6%, E-government at 6% and Transport at 3%. It also shows the rate for data mining methods used in public organizations, it shows that Concept/Class description rate used, is 17%, classification and prediction rate used, is 44%, cluster analysis is 11%, outlier analysis is 6%, and evaluation analysis is 22%. In [9], the paper surveys the application of data mining in traditional educational systems. In [10], the paper explores the effectiveness of data mining classification techniques in detecting firms that issue fraudulent financial statements. Researchers are also interested in developing the performance of data mining techniques in order to improve and obtain more efficient and effective work in special domains like huge databases. In [11], the paper proposes a new type of information pattern which is a small subset of objects selected from a large dataset. In [12], the paper proposes a methodology statistically proven for reducing search space existing in practical life.

1.4.1 Data Mining in E-government

According to our topic, data mining challenges represent an interest since the past to recent studies. These challenges are presented by mining distributed data, improving the ease of use of data mining systems, environments, and privacy and security issues for data mining. These challenges depend on the applications used by data mining. In [13], the paper discusses general grand challenges for data mining in business and scientific applications, the paper also discusses what makes problems and challenges of data mining exciting and motivating. It proposes criteria for good grand challenges like multimedia, link mining

problem, estimating one billion predictive models and text mining. So there are multiple domains and areas of applications to study data mining techniques challenges.

In this research, we are taking e-government environment as an application to identify the challenges of data mining techniques. Researchers of data mining techniques indicated the information explosion challenges and management information systems challenges in e-government [14]. To prove the challenges of data mining techniques, we must be able to manipulate the challenges occurred in e-government. E-government also searches in data mining process models to improve the efficiency and performance of used applications to extract and find knowledge. Technology of data mining is widely used in various fields which represent most recent daily applications, generating and collecting data that have been developing rapidly.

1.5 Problem and Motivation

Through the rapid development in information technology, e-government attempts to apply modern information processing utilities and modern communications network to manage and carry services and transactions on integration and optimization. Palestinian government is using this technology randomly without any basic electronic technology plans and strategy, there are no references in the Palestinian national authority to represent the standards that identify data structures, data types and business rules, also there is no agreement on how these communities benefit from the explosion of data collection of legal operational database systems that are used.

Nowadays the Palestinian government needs to consider this evolution of e-government carefully. Palestinian e-government proposed in this study assists Palestinian government to currently convoy the e-government in the world; it allows the government processes and policies to be constructed in an integrated operations and structures which will contain standard units, business rules, design layers, portal functionality, database and data mining

process models. This design allows us to build interoperability between process, data and knowledge, this creates an intelligent Palestinian design and models to support electronic Governance which supports government decision makers, citizens, business and other communities, which are all together, form the evolution of Palestinian e-government foundation.

1.6 Requirements of the Model Proposed

In this research, the process and information requirements must be determined and identified to produce an interactive Palestinian e-government model, these requirements identify the data mining process model and techniques used in electronic information center to support decision makers and polices.

So to collect these requirements, we identify the collection information form, form (1.1), this form collect processes functionalities and its information's, it identify the relations and dependences between the horizontal and vertical different government sections. This helps us build a coherent process structure and build suitable interoperability framework for any government operations, processes, services, legacy systems and agencies.

This thesis divided into six chapters: chapter one is introduction, chapter two is background, chapter three is Palestinian e-government model and design proposed, chapter four is a case study-health insurance for government employees, chapter five is validation, and chapter six is conclusion.

Chapter Two: Background

2.1 Introduction

This chapter reviews the most important papers research in the work of e-government process models and design, it also reviews the data mining process models and mining techniques, it defines and explains the basic concepts and environment framework for e-government and data mining model we use it through this research.

This chapter contains the following three sections: section one is introduction, section two e-governments, section three data mining.

2.2 E-government

This section clarifies and explains the most important topics addressed by researchers in e-government, which are considered a major background to what is being proposed and developed in this research.

2.2.1 E-government Process Models

In literature, e-government model is proposed and identified through a lot of research and studies to ensure the transparency and coherent of government work, and to give ease and flexible access and let all government parties follow up their work and services in clarity and credibility, many researchers in e-government proposed and defined many government models through different number of stages and functionalities to ensure the accuracy and integrity of government businesses electronically to achieve and find the key objectives that establish the government. Papers [2, 15, and 16] show some of these models identified and

developed by international companies or experts who have experience in e-government, Table (2.1) presents some of these models that have been discussed in previous papers.

Table 2.1: E-government Process Model

Model	Stages
Delloite	This model is suitable for enterprise level, this model contains six stages for developing e-government as follows: • Information publishing: in this stage, each individual government department sets up its own website that provides the public with information about itself. • Official two-way transaction: in this stage, users can transact information to individual departments with secure websites. • Multipurpose portal: portal allows customer to use a single point of entry to send and receive information. This also allows them to process monetary transactions across multiple departments. • Portal personalization: users can customize the portal with their desired features, Clustering of common services, the services with common nature are clustered to provide more convenient access. • Full interaction and enterprise transformation: The websites which have started by being just a storage and display centre of information are now a complete service centre.
Layne and Lee	This model plots the growth of technological, organizational complexity and integration of e-government. Four stages are identified for this model, these are: • Catalogue. In this stage, the government body has an on-line presence providing government information a catalogue of services (categorization of service information by service type or events), and possibly downloadable forms. The key challenge for this stage is the effective management of content across government units. • Transaction. In this stage, there is a general movement to offer customer interaction to on-line services typically by moving forms on-line and developing working databases supporting on-line transactions. Hence, the citizen moves from a passive to a more active role. The key challenge is the management of a high throughput of transactions. • Vertical integration. In this stage, local systems are linked to higher-level systems in terms of levels of government. Such integration is predicated on similar functionality between systems which typically demands changes to government processes and possibly structures as boundaries between government agencies blur. • Horizontal integration. In this stage, systems become integrated across different

	functions removing what are typically referred to as the functional silos of government. As a result real one-stop "shopping" for is available to citizens. The key technical challenge lies in integrating heterogeneous government databases and systems to provide a unified customer interface.
United Nation (UN	This model defines e-government model with five stages as follow: • Emerging: Basic and static information of government is presented through a few independent official sites. • Enhanced: Information is updated regularity. • Interactive: Some services are available. Users can download form, contact officials and make appointment. • Transactional: Financial transactions are available online and users can pay for services. • Seamless: All services and functions across administrative and departmental boundaries are integrated.
United Nation (UN)	This model defines e-government model with five stages as follow: • Emerging: Basic and static information of government is presented through a few independent official sites. • Enhanced: Information is updated regularly. • Interactive: Some services are available. Users can download form, contact officials and make appointments. • Transactional: Financial transactions are available online and users can pay for services. • Seamless: All services and functions across administrative and departmental boundaries are integrated.
World Bank's	This model was proposed by World Bank with three stages as follow: • Publish: Useful information to citizen which is generated by government is published on web. This information starts with rules and regulation, documents and forms • Interact: Start with basic functions like e-mail contact information for government officials or feedback forms that allow users to submit comments on legislative or policy proposals. • Transact: Users conduct transactions online. A transact website offers a direct link to government services, available at any time.
Chen	This model refers to an ICTT , which mean information communication, transaction, transformation, each one is: • Information. Government information is created, categorized, indexed and delivered to its citizens through the internet. • Communication. E-government services support two-way communication between

	government and citizen through web forms, e-mail and other internet media. • Transaction. Transactional services for citizens and business are supported as well as for inter-governmental transactions. • Transformation. Practices and services delivered to constituents are transformed through changes to government structures and processes.

2.2.2 E-government Design

From the previous studies [2, 17 and 18], we conclude that the design of e-government is a complex framework composed of multi layers which contains components to enable us to achieve a coherent e-government targets that allow interactions with e-government entities autonomously, the key objectives from these layers lie in three generic purposes: serving governments, acting as a channel between governments, their citizens and businesses, and facilitating governments' future investments in information technology. There are different frameworks for e-government that show parameters, main components inputs and outputs for e-governments. In this research we use the e-government model framework architecture shown in Figure (2.1) from paper [17].

As shown in the Figure (2.1), the design provided an e-government integrated architecture framework that contains four layers which help information technology sector in the public sector, to learn how to use and manage information technologies, to refresh and manage business processes, improve decision making, defines standards, infrastructure components, applications, technologies and so on, these structured layers are:

1. **Access Layer:** It is the simplest level of e-government architecture; it involves the channels that government users can access to the various government services. Government users can be citizens, business, employees, other governments, and other community members, the government users control and manages this layer. The channels of this layer may be online and offline channels or routes distributed through products, services and information that are used, accessed and

communicated by multiple technologies like web sites, PCs, mobile phone (WAP), digital TV, and call and contact centers, it is essential that public sector organizations provide a common way of finding all government information and services, maintain channel coordination, and follow the guidelines of technical standards.

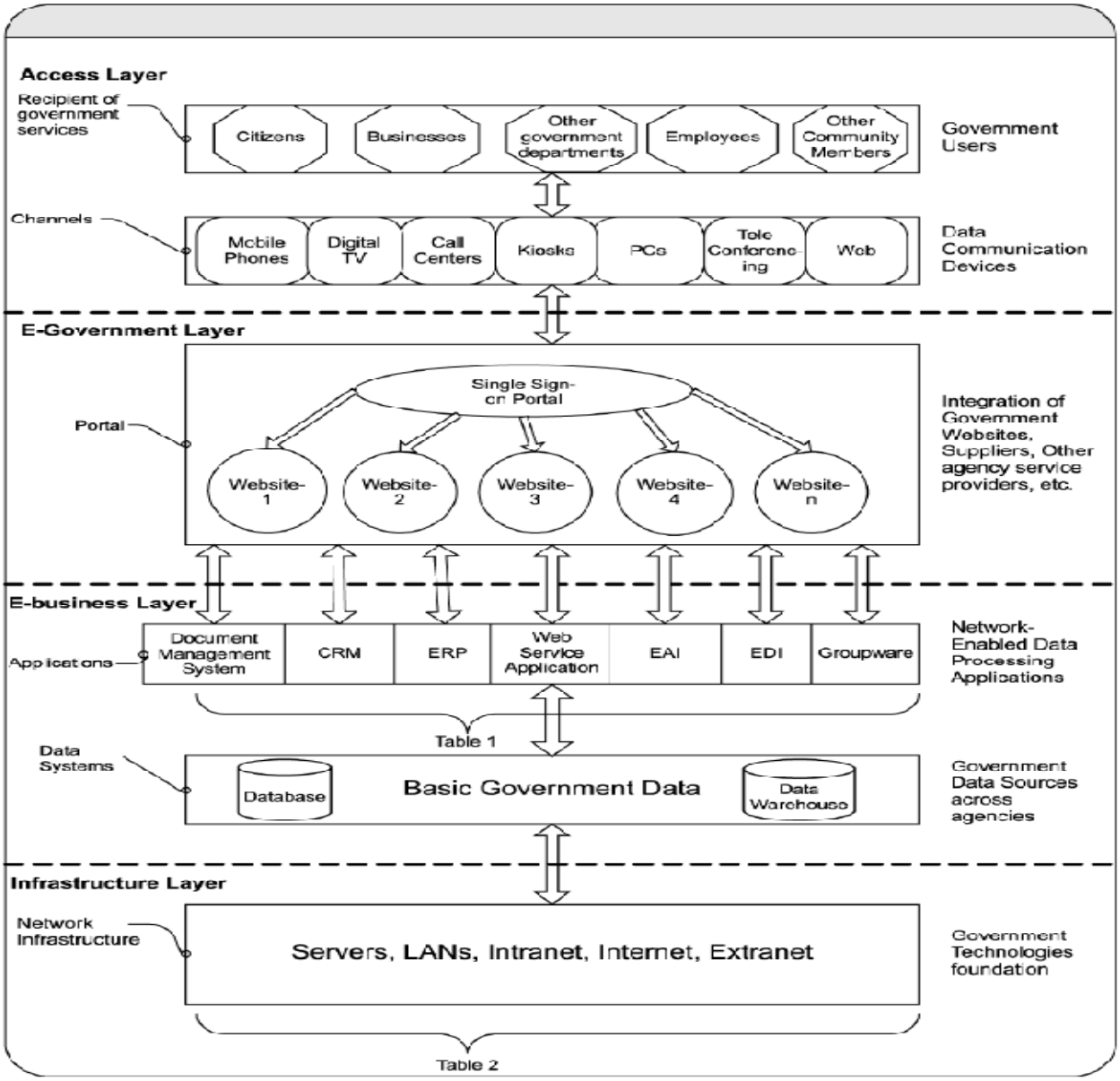

Figure 2.1: E-government Layers Architecture

2. **E-government Layer:** This layer integrates data from various organizations into a web portal of government services and process in a form of one step to represent e-government portal. This portal is an improved access to government resources; it

reduces service processing costs, and enables organizations to provide a higher quality of service, this allows public sector to develop their e-government initiatives and create electronic interaction between government and citizens (G-to-C), government and business (G-to-B), government and its employees (G-to-E), and government and government (G-to-G). Governments can access and manage all data and information while providing users with the opportunity to customize what they need from information.

3. **E-business Layer:** This layer is using the necessary information and communication technology to build applications and tools to connect trust networks; knowledge sharing and information processing that take place both within and between organizations. The implementation of this layer will set up a strong foundation to build and to support the relationship and interaction between G-to-G and G-to-E. It provides a seamless, automatic and real-time communication between their systems at both a data and process level. It enables employees to interact efficiently with other departments and agencies concerning human resources information, latest news releases, and showing the available resources in an optimal way. This helps support decision making in constructing new value chains and reinforces the existing business partner's relationship.
4. **Infrastructure Layer:** This layer focuses on technologies that should be set before e-government services can be offered reliably and effectively to the public. The potential of these technologies is to support and integrate the operations of information systems and applications in e-business layer across organizations by offering the necessary standards and protocols through network and communication infrastructure approaches.

From the above studies, the significance of e-government architecture framework is about the integration between government existing technologies, essential applications and information systems required for e-government operations. The consistency of layers should be given the required attention during the implementation of e-government, as in Figure (2.1), it shows that each layer is connected to the adjacent layer, which poor implementation of one layer could affect the performance of the rest of layers, and therefore, will degrade the performance of e-government.

2.2.3 Electronic Public Services

Transformation of public services into electronic public services is carried out by governments as part of their e-government and public sector modernization programs, but the rapid growth in e-government services resulted in duplicate and redundant services that could lead to confusion of customers and add complexity of doing the business with government when more than one government agency involved. This leads to research in the basic requirements so as to perform electronic public services in integration process to perform optimal intelligent e-government services delivery systems. In [19], governments offer a large number of public services to their customers and stakeholders, these services can be categorized into four classes:

1. **Certification Services:** the government issues various kinds of declaration to applicants, examples issuance of personal documents like passports, marriage contracts etc.
2. **Control Services:** aim to ensure conformance to regulations, example particularly visits and inspections by government officials or authorized representatives.

3. **Authorization Services:** the government agencies grant permissions and approvals to the applicants, examples granting licenses and permits as well as approving requests, say for welfare support, by the applicants.
4. **Production Services:** it includes infrastructural and utility services, as electricity, water or telecommunication services.

In [4], generic services can be shared by various government agencies to avoid the development of similar functionality over and over again; functionally one system can be shared and provided to all the other agencies involved. The design of services architecture is through identification of services, this design include 1) technology to ensure that services are technical possible and can be implemented. 2) Business process to ensure that generic services are identified and can be used in various business process, 3) Architecture to ensure that the new services can be integrated in existing architecture. Technical experts, information architects and business process experts from various layers government participate in identifying generic services and prioritize these services in order to be implemented.

2.2.4 E-government and Human Resources

In [20], e-government is a tool for achieving a greater efficiency in the Public Administration through the use of Information Technology. Government can't implement e-government without expert staff. This means that a major challenge of an e-government initiative is the lack of ICT skills in the public sector. The availability of appropriate skills is central for successful e-government implementation. E-government requires hybrid human capacities: technological, commercial and management. Technical skills for installation, maintenance, designing and implementation of ICT infrastructure are required; e-government human resources also need skills for using and managing online processes, functions and customers, to address human capital development issues, knowledge

management initiatives. Great focus should give to staff training, seminars, workshops in order to create the basic skills for e-government handling.

2.3 Data Mining

This section defines the components, terminologies and model defined through researches and previous studies are also considered as the basics and are useful to this research.

2.3.1 Data Mining Tasks

From [3, 11, 7], the tasks of data mining are very diverse and distinct, so different methods and techniques are needed to find different kinds of patterns in large database based on the patterns we are looking for, tasks can be classified into Table (2.2) as follows**:**

Table 2.2: Data Mining Tasks

Task	Description
Summarization	It involves methods for finding a compact description for a sub set of data. The results are a small set which gives a general overview of data with aggregate information.
Classification	Learning functions that map a data item into one of several predefined classes, it derives a function or model which determines the class of an object based on its attributes. Classification function or model is constructed by analyzing the relationship between the attributes and the classes of the objects in the training set, this function or model can then classify future objects.
Clustering	A common descriptive task where one wants to identify set of categories or clusters to describe the data, identify classes (clusters or groups) for a set of objects whose classes are unknown, the objects are so clustered that the interclass similarities are minimized. This is based on some criteria defined on the attributes of the objects, once the clusters are decided, the objects are labeled with their corresponding clusters, the common features for objects in a cluster are summarized to form the class description.
Trend Analysis	Series of data are records accumulated over time; the objects are snapshots of entities with values that change over time.
Regression	Learning function that maps a data item to a real value prediction variable.

Related to the main tasks of data mining mentioned above, data mining suggest a number of techniques that can be applied to any business problem, techniques adopted from many research areas including in Table (2.3):

Table 2.3: Data Mining Techniques

Data Mining techniques	Description
Association Rules	Are a powerful data mining techniques used to search through an entire data set for rules helpful in the nature and frequency of relationships or associations between data entities, the resulting associations can be used to filter the information for human analysis and possibly define a predictive model based on observed behavior.
Artificial Intelligence	Are recognized in the automatic learning framework as universal approximations with massively parallel computing character and good generalization capabilities.
Statistical Techniques	It's used to evaluate the results of data mining to separate the good from the bad. These include linear regression, discriminate analysis, or statistical summarization.
Machine learning (ML)	Participates directly in data selection and model search steps to address problems like classification, regression, time dependent prediction. ML field is basically concerned with the automatic design of rules similar to those used by human experts; it's able to identify the most representative attributes for a given task.
Visualization	Visual data mining techniques have proven itself in exploratory data analysis, and they also have a good potential for mining large databases.
Decision Tree Approach	Decision trees are tree shaped structure that represent sets of decision.
Genetic algorithm	Population of rules, each representing a possible solution to a problem, is initially created at random. Then pairs of rules are combined to produce issue for the next generation. A transformation process is used randomly to modify the genetic structures of some members of each new generation, the process is terminated when an acceptable or optimum solution is found or after some fixed time limit.

Each one of these techniques has a number of approaches and utilities used to apply on the system depending on the process goal.

2.3.2 Data Mining Models

Paper [21] discusses the methodology which supports the process that leads to find knowledge. The main reason for establishing and using process models is to organize the Knowledge Discovery and Data Mining (KDDM) projects within a common framework. All process models consist of multiple steps executed in a sequence, which often includes loops and iterations. Each subsequent step is initiated upon the successful completion of a previous step, and each requires a result generated by the previous step as its inputs. It ranges from the task of understanding the project domain and data through preparation and analyzing to evaluate understanding and application of the general result.

Through this paper [21], there are numbers of related data mining process models, each model is classified and based on model type which refers to the authors and also based on the area that represents the field in which the model implemented. These models are in Table (2.4):

Table 2.4: Data Mining Models

Model	Description
Fayyad Model (1996)	The area of using this model is academic, it's a nine step KDDM process model which consists of these steps: Developing and Understanding of the Application, Creating a Target Data Set, Data Cleaning and Preprocessing, Data Reduction and Projection, Choosing the DM Task, Choosing the DM Algorithm, Data Mining (DM), Interpreting Mined Patterns, Consolidating Discovered Knowledge.
Cabena Model (1998)	The area of this model is used in the industry, it's a five step KDDM process model which consists of these steps: Business Objectives, Data Preparation, DM, Domain Knowledge Elicitation, Assimilation of Knowledge
Anand & Buchner Model (1998)	The area of this model is used in the academic, it's eight step KDDM process model which consists of these steps: 1. Human Resource Identification, 2. Problem Specification, 3. Data Prospecting, 4. Domain

	Knowledge Elicitation, 5. Methodology Identification, 6. Data Preprocessing, 7. Pattern Discovery, 8. Knowledge Post-processing.
CRISP-DM Model (2000):	The area of this model is used in the industry; it's a six step KDDM process model which consists of these steps: Business Understanding, Data Understanding, Data Preparation, Modeling, Evaluation, and Deployment.
Cios Model (2000)	The area of this model is used in the academic, it's a six step KDDM process model which consists of these steps: Understanding the Problem Domain, Understanding the Data, Preparation of the Data, Data Modeling, Evaluation of the Discovered Knowledge, Using the Discovered Knowledge
Klosgeņ Zytkow Model (2002)	This model is less significant, its seven steps modeļwhich consist of Definition and Analysis of Business ProblemsŗUnderstanding and Preparation of DataąSetup of the Search for KnowledgęSearch for KnowledgęKnowledge RefinementțApplication of Knowledge in Solving the Business ProblemsŗDeployment and Practical Evaluation of the Solutions̃
Klosgeņ Zytkow Model (2002)	This model is less significant, its seven steps modeļwhich consist of Definition and Analysis of Business ProblemsŗUnderstanding and Preparation of DataąSetup of the Search for KnowledgęSearch for KnowledgęKnowledge RefinementțApplication of Knowledge in Solving the Business ProblemsŗDeployment and Practical Evaluation of the Solutions̃
Haglin (2005)	Its less significant use, also its seven steps model which consists of: Goal IdentificatioņTarget Data CreatioņData PreprocessingData TransformatioņDMĮEvaluation and InterpretatioņTake Action stepș̃

2.3.3 Review of Data Mining Algorithms

Research paper [22] identifies top 10 algorithms that have been widely used in data mining which was presented at ICDM '06 in Hong Kong, these algorithms are C4.5, k-Means, SVM, Apriori, EM, PageRank, AdaBoost, kNN, Naive Bayes, and CART. These algorithms are the most influential data mining algorithms in the research community and widely used in the data mining community and cover the most important topics in data mining research

and development; they also cover classification, clustering, machine learning, association analysis, and link mining. The algorithms in Table (2.5) are:

Table 2.5: Data Mining Algorithms

Data Mining Algorithm	Description
C4.5 and beyond (Decision trees, Rule set classifiers):	It's a classification task, Systems that construct classifiers taken as input a collection of cases, each case belongs to one of a small number of classes and described by its values for a fixed set of attributes, classifier output can accurately predict the class to which a new case belongs. C4.5 generates classifiers expressed as decision trees; it can also construct classifiers in more comprehensible rule set form.
k-means:	It's a clustering task, its a simple iterative method to partition a given dataset into a user specified number of clusters k.
Support vector machines (SVM)	It's a machine learning task, it requires only a dozen examples for training by maximizing the margin between the two classes, the margin is defined as the amount of space, or separation between the two classes as defined by the hyper plane.
Apriori	It's an association rules task, It is to find frequent item sets from a transaction dataset and derive association rules and it is insensitive to the number of dimensions.
Expectation–Maximization (EM)	It's a clustering task, Used to model the distributions of a wide variety of random phenomena and to cluster data sets [57]. Here we consider their application in the context of cluster analysis.
PageRank	It's link mining, It is a search ranking algorithm using hyperlinks on the Web. Based on the algorithm, they built the search engine Google,
AdaBoost:	It's machine learning, It is one of the most important ensemble methods Ensemble learning that deals with methods which employ multiple learners to solve a problem.
k-nearest neighbor classification (KNN)	It's an a classification task, It finds a group of k objects in the training set that are closest to the test object, and bases the assignment of a label on the predominance of a particular class in this neighborhood. There are three key elements of this approach: a set of labeled objects, e.g., a set of stored records, a distance or similarity metric to compute distance between objects, and the value of k, the number of nearest neighbors.
Naive Bayes	It's a classification tasks, given a set of objects, each of which

	belongs to a known class, and each of which has a known vector of variables, which aims to construct a rule which will allow assign future objects to a class, given only the vectors of variables describing the future objects. Problems of this kind, are called problems of supervised classification, are ubiquitous, and many methods for constructing such rules have been developed.

2.4 Related Work

This study providing an a suitable approach for designing and for adapting Palestinian e-government process model and identifying appropriate data mining process model based on the previous studies that have been mentioned in this chapter. So, related to the subject of this research ‘data mining in e-government: the design of Palestinian e-government and identifying suitable data mining model‘, this study adapting suitable framework environment for Palestinian e-government model and design, and it provides a suitable place for using data mining process model and techniques.

The information provided and discussed in this chapter give us the basic ideas to think in 1) how this research becomes familiar with issues required and must be considered for building e-government proposed design and for identifying suitable data mining model, the e-government design is describe to be composed of four layers, these layers are access layer, government layer, business layer and infrastructure layer, each layer represent special requirements and purposes in composing e-government design, but in this research the e-government design proposed composed of five layers, e-rules layer added as a new layer, this layer contains the basic requirement issues needed for all the other four layers in the design, it contains standards, security, policy, laws and constraints, each one from these requirements must be applied to all other four layers in the framework architecture implementation and design, the framework proposed in this study explains the action mechanisms of the working design, this mechanism depends on the exchange messages

between the access points and interface, e-government in this framework divide the e-government into government entities, each entity has specific domain work in government work, each entity has its own transactions and movements with other entities as health insurance entity, it has a relation with customer register interior entity and payroll entity.

Also 2) the adopted e-government process model proposed in this research is built from different six e-government models mentioned in this background, the proposed model describes the Palestinian e-government processes workflow, it reflects each entity operations and translates its functionalities in e-government framework architecture design, this composed from sex stages, these stages are online presence, interactions, transactions, functional interface, transformation and information integration, all these model stages will be explained next in chapter three.

3) To become useful from the explosion of information, the Palestinian e-government framework architecture proposed electronic information center, this center uses the proposed data mining process model and technique to extract and transform data from different data sources to support decision makers and policies, this center produce system using from different sections to support decisions and policies.

In the next, chapter three studies the Palestinian e-government model and design, this chapter deals with all the above issues to organize Palestinian government processes and operations, it propose Palestinian e-government framework architecture design using the e-rules layer and the process model proposed.

Chapter Three: Palestinian E-government Model and Design Proposed

3.1 Introduction

Previous studies mentioned in chapter two describe e-government models and design, this is based on individual skills and experiences, this chapter proposes to adapt a suitable Palestinian e-government process model and identify the most appropriate Palestinian e-government design and framework architecture in an easy and integrated way.

Palestinian government uses information and communication technology in its work and operations, it uses different applications, communications and databases, Palestinian e-government could benefit from these backgrounds to build its own e-government model and designs to fit with Palestinian government work environment and resources, so the previous e-government models are adapted to produce and propose a Palestinian e-government process model by dividing the proposed government process model into six stages, these stages are online presence, interaction, functional integration, transaction, transformation and information integration stages which will be explained later in this chapter.

Also the Palestinian e-government design divides the e-government work environment into five layers, each layer has its own work, these layers are rules layer, access layer, e-government layer, business layer and infrastructure layer, the Palestinian e-government framework is proposed for Palestinian government organization processes and management

operations and customers, each government unit is represented as e-government entity, each entity has its process and relations with other entities in vertical or horizontal level. E-government messages proposed through this design is set to transform and communicate different services between different entities in different levels, also the bus and message are used to communicate within the same entity, public access interface is used to exchange information in the framework proposed as explained later, the most instrument that supports and represents the core of the framework architecture proposed depends on five foundations that includes customers/parties, public access interface, business process, business services and interoperability, each one represents basis in e-government proposed as explains later in this chapter.

This chapter presents proposed model description, proposed model design, e-government entity proposed framework, e-government proposed model architecture, and interoperability and finally services.

3.2 Model Description

This section looks for adapting the model that represents the functionality of Palestinian e-government processes model in different stages by depending on the current level and situation of the information and communication used, these stages include:

1. **Online Presence:** this includes publishing government information online beginning with rules and regulations, documents, and forms, and so on, it’s the ability to explore and download information. Examples: definition processes steps of operations; a defined document needs to produce a passport.
2. **Interaction:** this includes services which present ability to make a query and the ability to fill up applications. Example: filling up an applicant's, company query on tax amount.
3. **Functional Integration:** this includes the ability to merge different functions to perform operation as one unit from different responsible centers. Functional Integration is very

versatile because many different operations can be performed through API. Example: united form to collect revenues from different ministries.

4. **Transaction:** this includes the ability to perform transactions on each ministry database. Example: revenues of ministry of transport pay on ministry of transport and in account of ministry transport.
5. **Transformation:** this includes transform ministries databases to be represented in center database for analysis and reusing information.
6. **Information Integration:** this includes a united database shared between all ministries and can be accessible for performing a query from a businesses and citizens, perform transactions from ministry agencies. Example: human resources database, each person information using from each ministry

3.3 Model Design

Traditionally, the government divided authority governs and workflow between agencies by depending on rules, laws, policies and democracies, and because the government represents society, the clients must have correct, trust and credibility in the e-government processes and operations. The proposed design in this study divides e-government design into five layers as shown in Figure (3.1), each layer represents the sequence work of government units, these units' work as a collection of autonomous entities, these layers are rules layer, access layer, government layer, business layer and infrastructure layer.

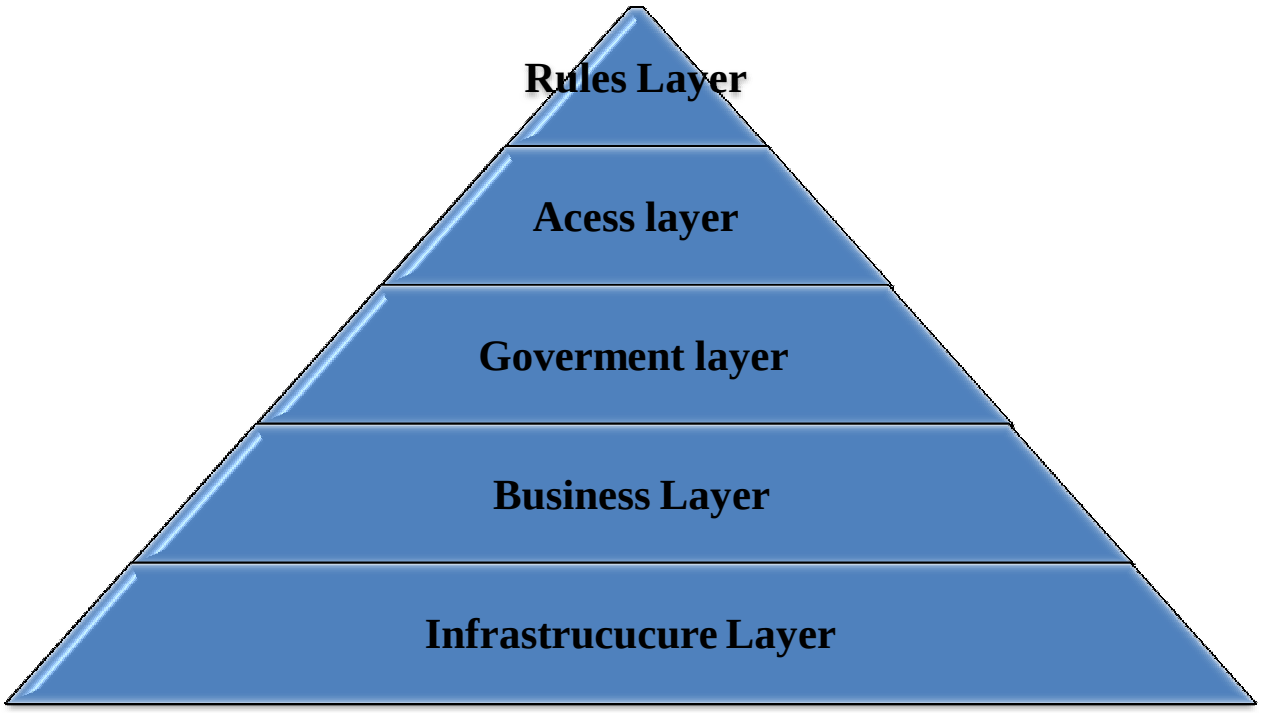

Figure 3.1: Layers Hierarchy in Palestinian E-government Design

E-Rules Layer is in the top of the drawing hierarchy, it constructs authority by containing all governs need, as constraints, policies, laws, standards and security, the definition of these components controls and regulates e-government to become e-governance, so all government sectors united are sharing in these components to form e-governance authority, this layer contents is shown in Figure (3.2), the policy which includes all the decisions needed to represent the government strategy to support e-government process and development, the intended audience for this part are policy analysts, advisors, business analysts or anyone involved in government strategy and projects. The standards focus on the standards that make up interoperability framework, it is categorized into data, messages standards, the data standard allows the definition of the data structure for all e-government operations like the name of the citizen, the message standards that defines the standard messages names, types and structures for all e-government messages defined. Constraints represent the business rules which involve the agreement on which the business activities of the concerned parties affect each other; it represents the workflow of the process. Laws

identified the whole legislation and laws that are working by the authority, it's necessary for constraints work. Also the security content identified all levels of protection which is necessary to ensure the confidentiality of the work and it is important for the distribution of the privileges.

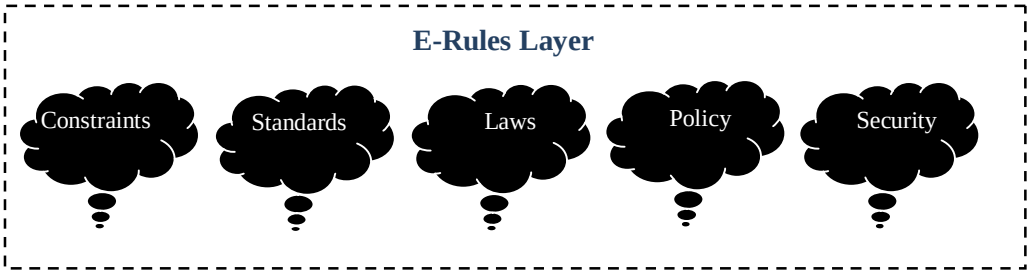

Figure 3.2: E-Rules Layer Contents

Access Layer represents the second layer in the drawing hierarchy as shown in Figure (3.1), it includes government users and channels as shown in Figure (3.3), users represent the beneficiary from various government services, they include citizens, businesses, employees, and so on, These users can use the various government services depending on different levels of privileges vested to them, security that is used to control and manage these users are identified in the previous layer, but in this layer users can use privileges identified and allowed to them. Government channel from this layer identifies the access and communicates tools that the users of government service could be used to enter and browse these services, these channels like mobile, PCs, Teleconferencing and so on, channels of this layer may be online and offline channels or routes distributed through which products, services and information are used, it is essential that public sector organizations provide a common way of finding all government information and services, maintain channels and coordinate it depending on the guidelines of technical standards.

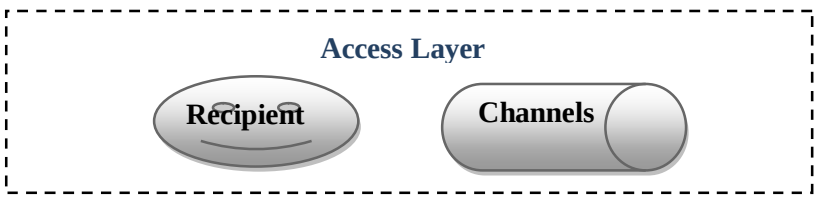

Figure 3.3: E-government Access Layer Content

Government Layer represents e-government portal contents and functionality as shown in Figure (3.4), this portal is designed to serve beneficiary to access the previous services provided by e-government, it allows citizens to operate with their processes and activities, it serves businessmen to perform their operations and activities like company registration, provides the foreigners with all services and processes to allow them travel through e-government and to accomplish their tasks and access what they need as donor countries, helping them to deliver projects and provide them with all the requirements necessary to accomplish their work and transactions, refugees also constitute to a large segment of the Palestinian people, so we are working through this task to put all the services and transactions available to them, the portal also serves the social community that includes non-governmental sectors, international organizations and human rights bodies by providing information and reports necessary for them.

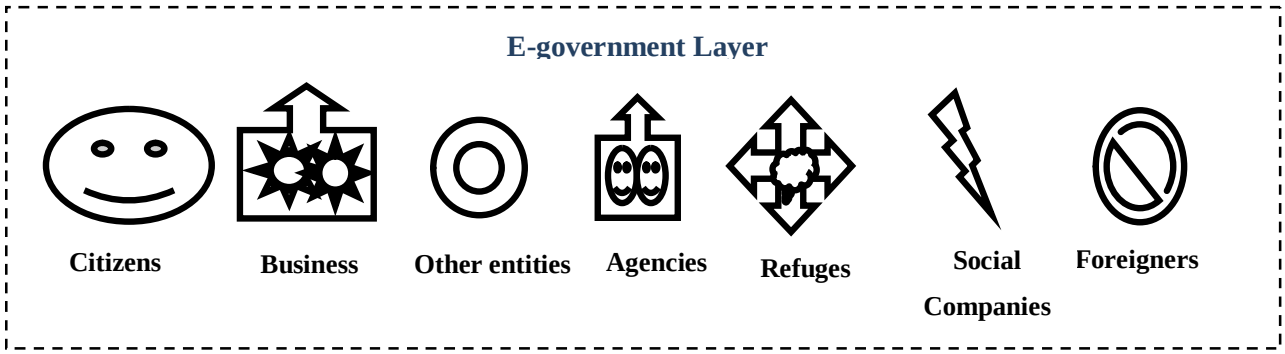

Figure 3.4: E-government Layer Customers

Business Layer is responsible for providing applications and data necessary to provide government services, as in Figure (3.5), it represents a higher contribution in building governments entities, it works on the classifications for establishing and building the movements required for e-government customers, the applications, data sources and electronic information center composed the most three components in this layer, applications represent the real government work applications, it also includes the tools and applications required to enable network data processing. Data sources contains real

government data, these data systems represent database operations in centralized or distributed workplace, it depends on government processing, the integration is needed between government agencies to complete meaning of electronic processing when it's required and possible. Electronic information center needs to transform real database operations over date and time, data warehouse performs for all database operations to collect knowledge, after collecting and transforming this data to information, the data mining tools is applied to gain knowledge that supports political and decision makers. So this layer uses the necessary information and communication technology to build applications and tools to trust the networks connection , knowledge sharing and information processing take place within and between government entities, it provides seamless, automatic and real-time communication between their systems at both data and process level. These results are used in supporting decision making in construction of new value chains and reinforces the existing customer's relationship.

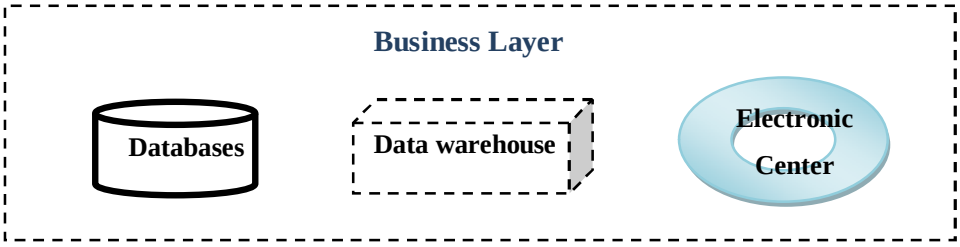

Figure 3.5: E-government Business Layer

Infrastructure Layer focuses on infrastructure that will be needed to handle all the complexities of communication between different national and sector administrations, Figure (3.6) shows the basic contents of this layer, It's used to ensure the basic transmission of information, the translation of information content, it will be used to link up internal administrative processes across organizations, in the terminology of the interoperability framework, it will ensure a technical, semantic and organizational interoperability, so to determine the required capabilities for establishing a high level architecture of infrastructure for e-government processes and services, the implementation concern on the requirements

analysis and architectural description and also its assessment of technology trends that could impact on infrastructure of servers, LANs, internet and extranet.

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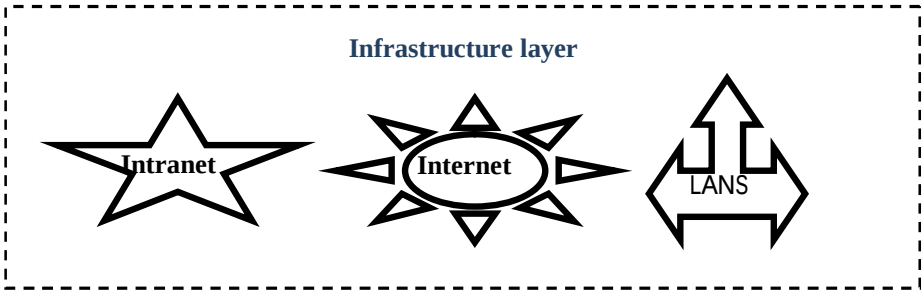

Figure 3.6: E-government Infrastructure Layer

Figure (3.7) summaries and explains the relationships between these five layers and identifies the functionalities of each layer content, rules layer represents works as a container of all the other four layers, these other four layers apply rules layer contents on each design and implementation work.

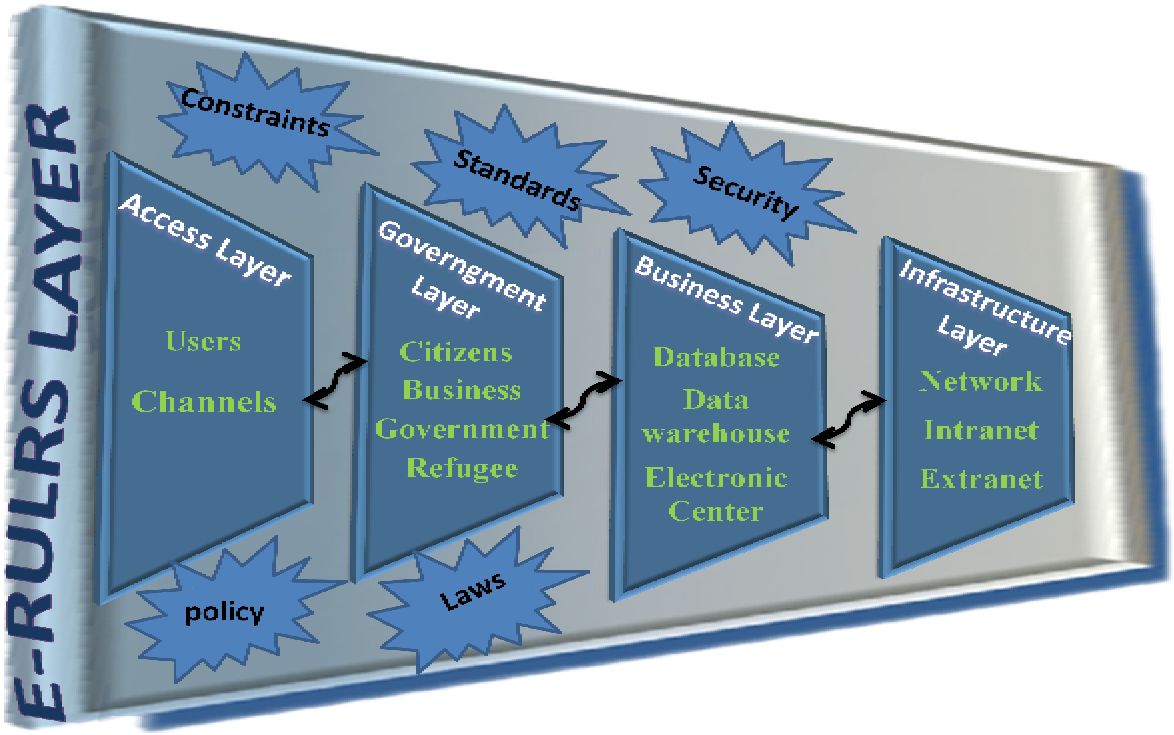

Figure 3.7: E-government Five Layers Relationship and Functionality

3.4 E-government Entity Framework

The framework proposed in this study represents each government unit organization as e-government entity, each e-government entity works with the other vertical and horizontal

government unit, the contents and relations of each government entity is shown in Figure (3.8), as it shows these contents that includes the actors, access points, legacy systems, applications, messages, electronic centers and all the rules layer contents mentioned above which is the standard, constraints, policy, security, and laws. Interface here represents the relations between all the e-government entity relations.

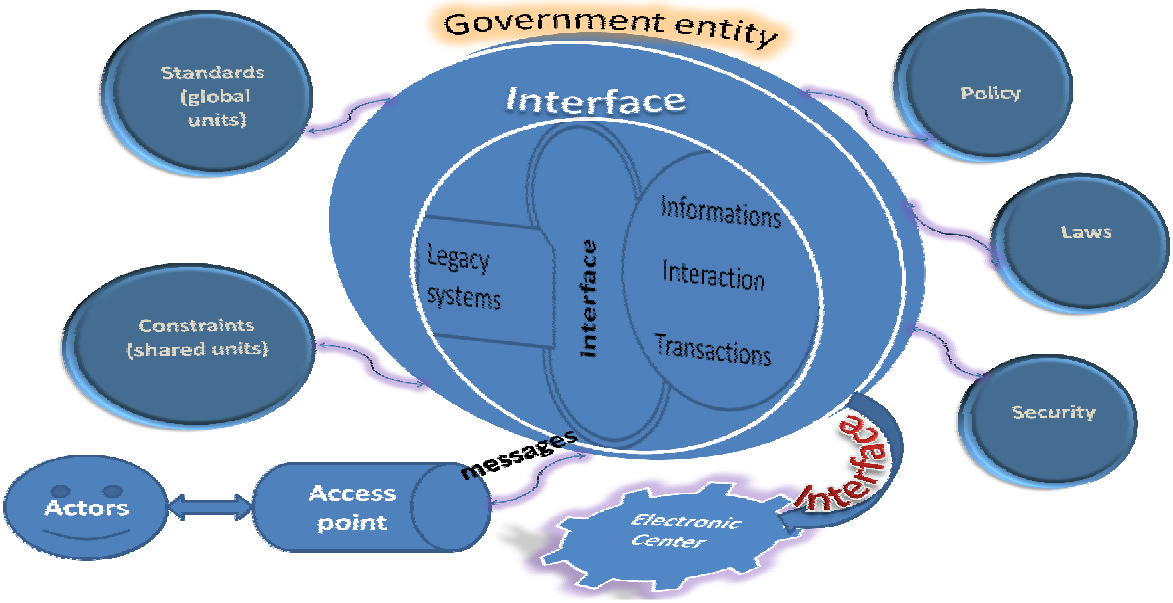

Figure 3.8: E-government Entity framework Contents and Relations

E-government Entity (EGE) represents autonomous government operations, messages and interfaces using to interact with other e-government entities or any other framework components, the procedures of each entity may be different from other entities, each entity has its own functionalities, standards, laws, constraints, security and policy, legacy systems used to transform data between entities, the interface is used to transform data converted between entities applications and systems.

Customers (actors) used messages to request services from government entities, these messages have a standard format, each message defined has its own semantics meaning and its own operation, the standard definition of the message includes the syntax and semantics definition, each message operations reply through different channels, messages sending and receiving through interface or access points. The access points (AP) work as input and

output channels between the systems and customers (citizens, businesses, governments…), the customer or other government entity requests services or information, these requests triggers to consecutive messages and to process through the concerned government entities, when requested services are completed, the feedback is delivered through the same access point to customers.

Interfaces reflect the protocols set by the political, lowers, standards tool, security and constraints, it achieves the separation of responsibility and authorities among government entities, so it controls and coordinates relationships among theses EGE, the interact between EGE's is only via these interface, transparency is achieved and great services offered, each interface can has multiple levels of interactions.

Electronic information center is used to transform information from government entity, it connects these entities through interface, data warehouse will be applied to convert database operations into information, and the collected information is transformed to knowledge, this knowledge is used to support e-government entities, policies and decision makers.

Each e-government entity has its own standards or it uses common standards requested from rule layer, standards must be available to ensure that all entities use common and reliable standard to allow accurate work in workplace, so there is ease of use in data and process integration and conversion. Security over each entity is used to identify different levels of security over EGE processes, customers and communications. Laws are used to support the law over all e-government, EGEs perform the work by depending on approval laws taken from authorities to trust the work, and constraints are used to identify the relations between different EGEs, each EGE identifies the rules that will be used to deal with other entities, this gives each EGE flexibility to share work with other entities without overlapping between EGEs processes and activities, policy is used to put the political lines

and decisions that are contributed in changing of EGEs actions, it changes cooperation between these EGEs that are reflected in all the e-government framework.

3.5 E-government Model Architecture

E-government model proposed architecture is composed of different basic elements mentioned above that are needed to build and develop e-government proposed architecture, each element has its own purposes and functions, Figure (3.9) focuses on these elements and its relations, we collect these elements from above to perform a suitable framework architecture, elements composed from business rules, customers, middleware, mediator, legacy systems, applications and electronic center.

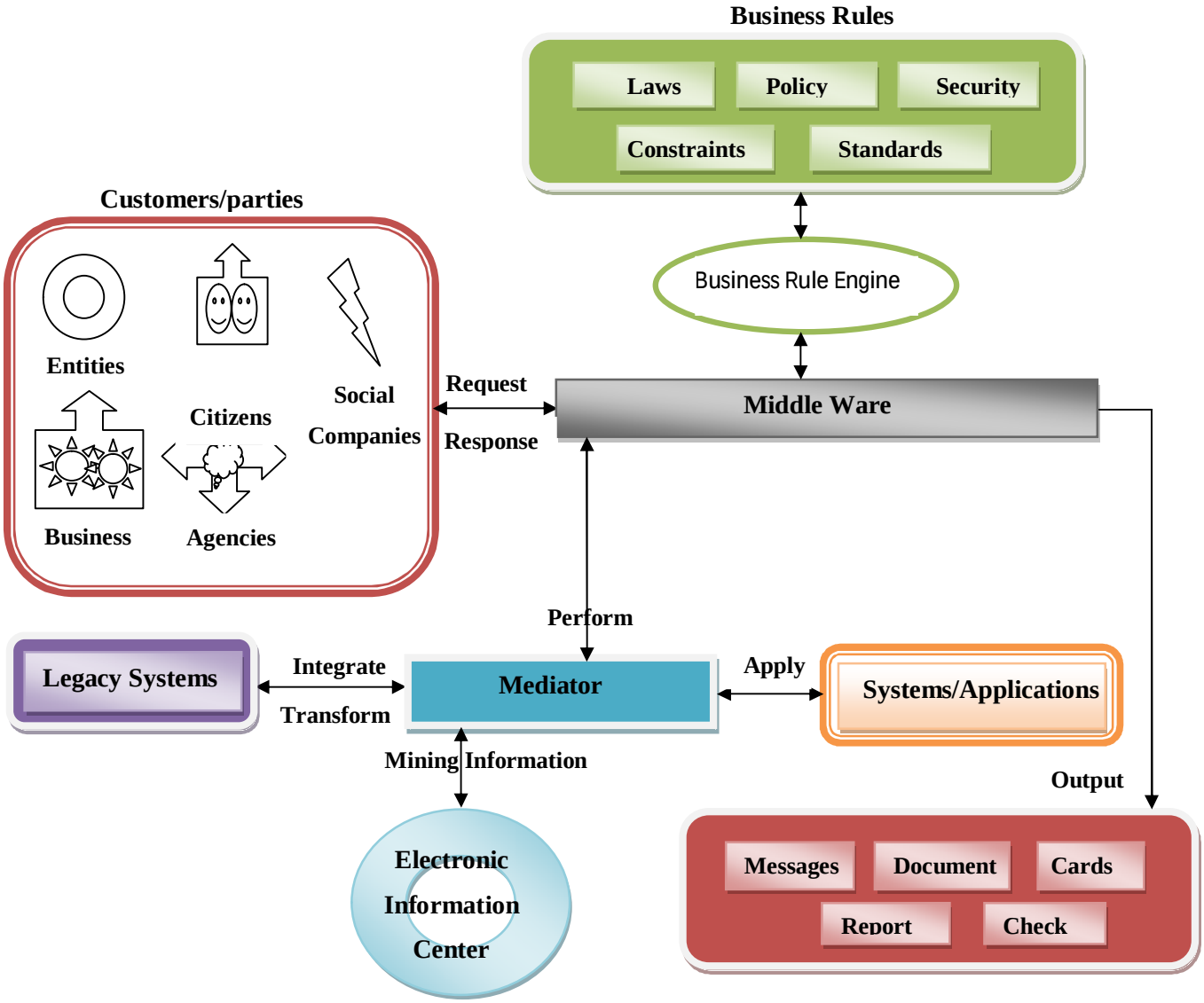

Figure 3.9: Palestinian E-government Framework Design Architecture

Middleware element represents the core in e-government model proposed framework architecture, it works for providing and processing services requested from different customers, middleware is composed of three basic entities needed to process and manage services provided and requested, these entities include the public access interface, business process and business services, the relations between these entities are shown in Figure (3.10).

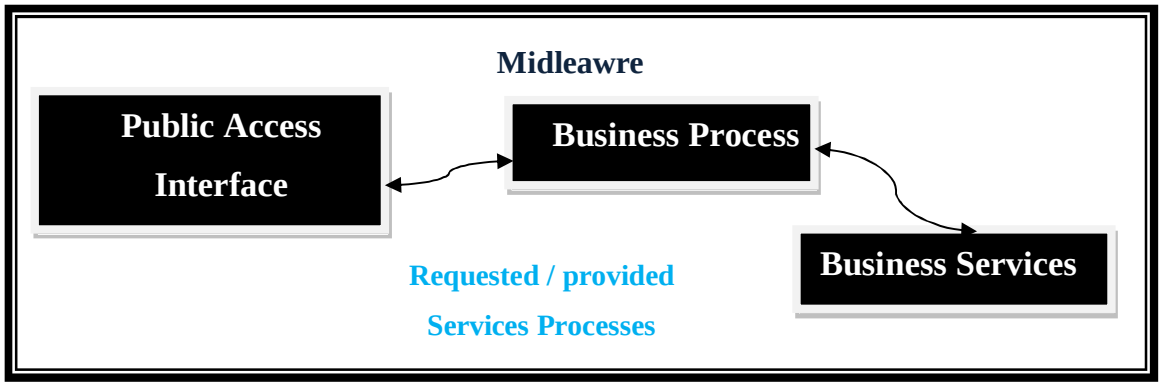

Figure 3.10: Middleware Element Basic Content

Public Access Interface represents the access point for all the customers/parties that will use e-government, each part has its own access point to request their services and perform their operations, each one has its own key definition and operations that are used to perform and process or review and apply services provided from e-government entities.

Business process represents the core of the requested operations from parties for processing and implementation, it may be combined from different types of process components, these components are composed of functions, procedures, activities and events, the relations between these components depend on the work, definition, classification, and operations of the processes that provide these utilities, it depends on the real work operations that the business process performed, the execution of the business process produces output in different format, when there is a problem in business process the re-request message is sent to the interested parties to write your request for continuing the process, the reprocess performs and serves through suitable business services, when the execution is complete as

expect, the output message returns to the part to inform the process ready, and the physical output must be delivered from the concerned location at any time, wherever and however it was, this represents the core of operations required to implement the work of business services, its output is delivered and supported by the services component for all the parties in Palestinian e-government.

Business services provide high level view of the services and capabilities that will support enterprise applications and organizations process, so business services identifies different types of the services driven like parties' services, process automation services, business management services, support services, business analytical services, digital asset services and back office services. Parties services identify the domain that identifies parties' relationship and management, the process automation services identify the process of tracking, workflow, process routing and scheduling, the business management services identify the process management, organization management, investment management and so on, the support services identify the security management, collaboration, search, communication, system management and forms management, and business analytical services identify analysis and statistics, visualization, knowledge discovery, business intelligent and reporting. The digital asset services identify content management, document management, knowledge management and records management, and the back office services identify data management, human resources, financial management, material management and development and integration, and there are different other business services that must be driven to support abilities to share and reuse applications, processes, business services and components

Business Rules as mentioned above**,** come from (constraints, laws, security, standards, policy) over each entity, these business rules contain all the rules that will be applied on the business processes which affect the services, processes and outputs behavior, over this

process operations, the business rule controls the executions of these entities, controls and identifies the relationships between these entities, controls and registers the security (authorization, authentication, privileges) between these entities, it also identifies and classifies the suitable standards for these entities.

Business Rule Engine is a software system that executes one or more business rules over runtime environment. The rules might come from different resources represented in e-government like laws, policy, security, constraints and standards. This rule engine software is commonly provided as a component of a business rule management system which provides the ability to register, define, classify, and manage all the rules, verify consistency of rules definitions, define the relationships between different rules, and relate some of these rules to IT applications that are affected or needed to enforce one or more of the rules.

Customers/Parties represents different types of users that will be used and benefited from e-government services and operations, these parties like agencies, citizens, other entities, businesses, social components and so on. The agencies users represent the government employees, it will be classified into different types of e-government employees which includes e-government admin., auditor, observer, checker…and so on, each one has its own privileges, authentications, authorization, each one has its own definition, it may include the definition of other e-government back office. The citizen's users represent Palestinian citizen's, it has different types of citizens like refugees, immigrants, returnees, visitors, foreigners and so on, the other entities represent other e-government entities, these entities have relations and related work with the other entities, business allows the business to enter into the government through its own definitions and privileges to make their own requests and transactions process that interacts with its own government operations, the social companies allow the community based associations, NGOs and human rights organizations

and donor countries to see and inquire about their own interests in government work within the powers and privacy recognized in the public.

Mediator as shown in Figure (3.11) contains the services components and resources used to perform and interoperate the business services between different types of legacy systems and applications request. The services components represent tools, programs, components, and all requirements used to serve services process, each business service may has its own type of services components. Resources contain the required information, the common and shared data is used to process business processes, it also represents the physical requirements like building, expenses and so on, all these resources need to perform, support and complete business processes operations.

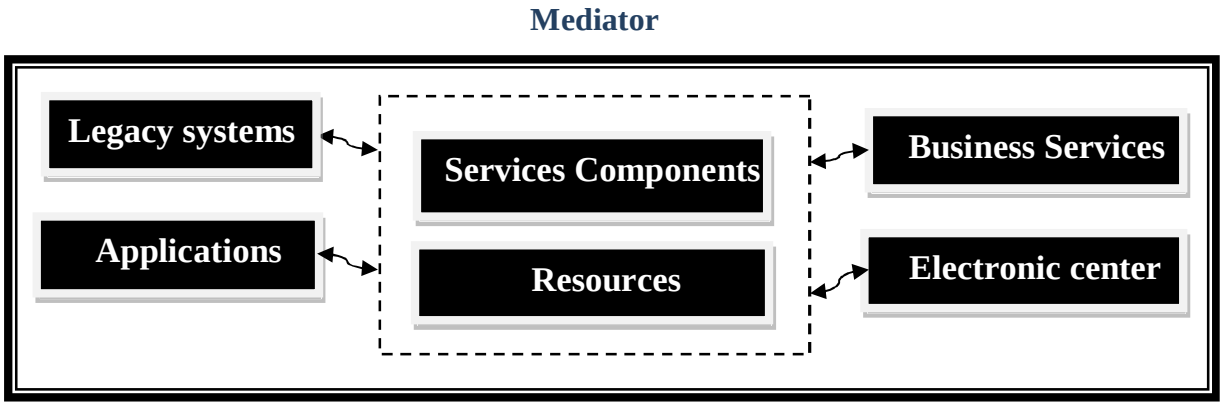

Figure 3.11: Middleware Entities and Relations

Electronic Center works as a container for all transformed database operations, these database are transformed over a date and time to form e-government data warehouse, data mining uses data ware house to extract information, Fayyad data mining model, mentioned in chapter two, is used to acquire knowledge that supports policy and decision makers, data mining techniques will be performed from the proposed model to work and collect knowledge that data in electronic center provides.

3.6 Interoperability

E-government interoperability is the ability of citizens and government agencies to work together in different levels, these levels include technical, data and process levels, citizens can be found and accessed to perform public services and operations through government portal without knowing which government departments offer these public services and operations. So interoperability is the ability of government elements and communications technology (ICT) and applications, systems or components to exchange information and perform operations to improve governance decisions to support and provide better public services. Technical Interoperability (tools) is an agreement on what communication protocol and message format is used when different parties send and receive information between each other, as xml schema, xml signature, xml encryption, xml signature will be applied to perform a certain purpose from interoperability, HTTP is used to send xml messages. The Data Interoperability (Standards) concerns on how different parties agree on what information to exchange, and it concerns on the definition and representation of information, its agreement among independent parties about how to go for doing some task, as delivery date must identify the same through all different positions used. And the process Interoperability (constraints) is an agreement on how the business activities and operations of the concerned parties affect each other, it is represented as principles and guidelines between different government departments, as time period specified is determined to reject or accept the purchase order sent from buyer to seller.

Achieving interoperability through the three levels above (technical, standards, process) will compose Government Interoperability Framework (GIF), it's a set of technical specifications, standards and guidelines that government uses to specify the preferred way that agencies, citizens and partners interact with each other, so depending on GIF e-

government strategy implementation could be supported strategic planning framework relates and aligns government ICT with government functions that supports and identifies it. Figure (3.12) shows e-government architecture design and the relations between all elements and entities in more details.

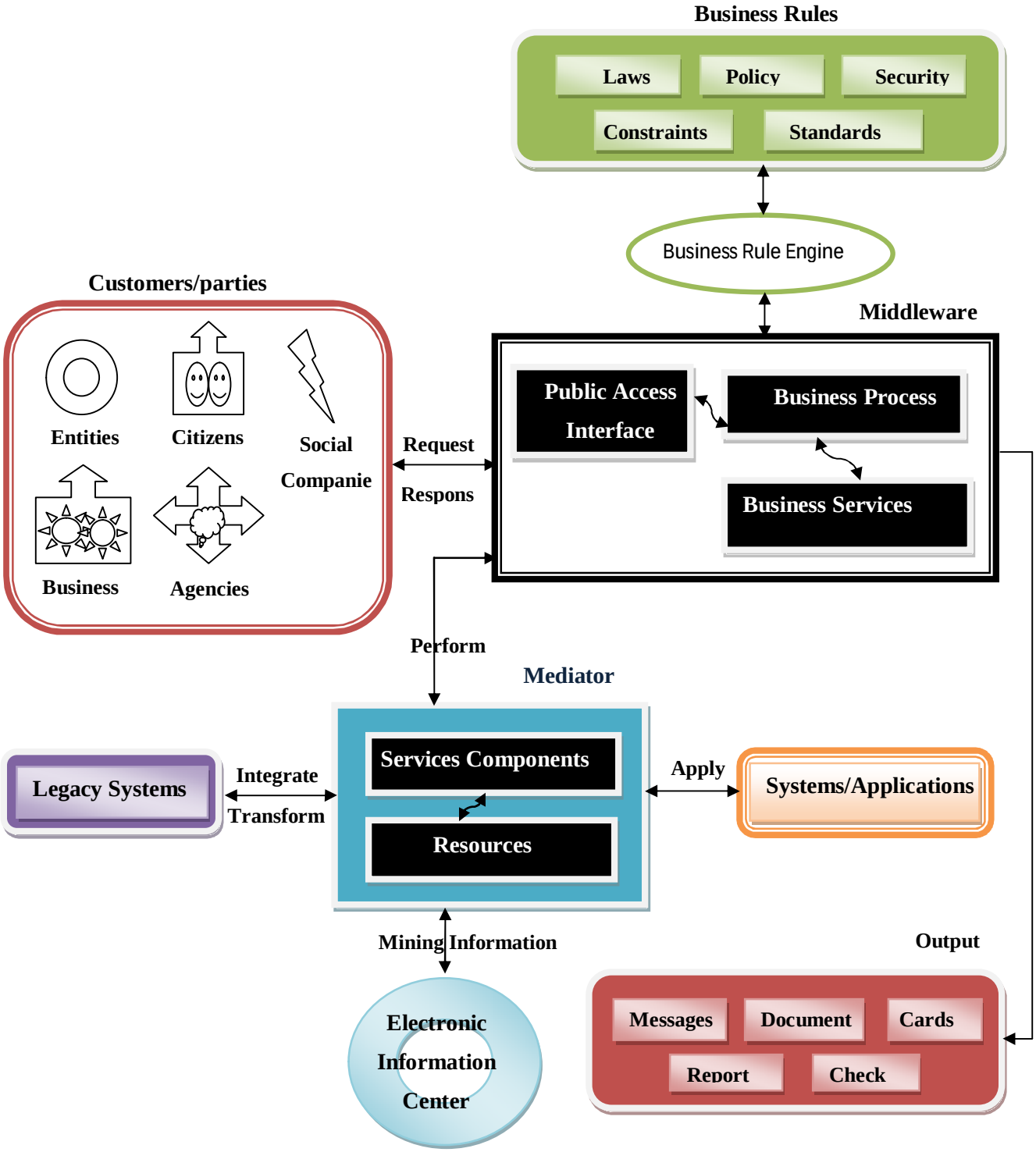

Figure 3.12: Palestinian E-government Model Design Architecture in Details

3.7 Services

This part of study is concerned about the definition and classification of electronic services that Palestinian e-government could offer and provide, customers of e-government should be able to access and use services through the Palestinian e-government portal, this portal contains the electronic classification of the services provided based on the customers class, customers split into Palestinian people citizens, government agencies, business and foreign, refugees and so on, services forms for these users concerned with all type of services that government could offer and provide. The research in this study contributes to find ways for these users to communicate with their government. So services for Palestinian e-government could be classified as in public services and shared services, public services concerned with government agencies, it represents the common and the public use of e-government services from different e-government agencies, it represents the source for all bodies and institutions that use it in their operations and transactions such as personnel affairs. The shared services classify the services that will be shared between different e-government agencies, each agency has its own privilege to access this service, services are classified through e-government portal to help and serve customers to perform all requests and operations, these processes are performed and manipulated by passing it to EGE which concerned and worked on this service, portal services will be classified under financial, social, education, trade, economic and health and so on.

Chapter Four: Case Study – Health Insurance for Government Employees

4.1 Introduction

To test the model, there are different government services that can be studied and applied, but here we will study health insurance service for government employees to study the possibility of the model application as a case of study, this service works and be executed depending on government policy, law and constraints, health insurance has its own form and used to select the type of insurance you need, this chapter tests the using of this model in e-government through the government employee health insurance case study, and how the model framework works to serve the purpose of e-government by matching between the health insurance work and the model work.

This chapter presents health insurance definition, the current situation for government employee health insurance system, the health insurance system for government employee in e-government model proposed, and the employee government health insurance technology proposed.

4.2 Health Insurance Definition

It is a program offered and attended by the ministry of health to address health hazards to individual as well as a willingness to address them. The system aims to provide health services exempted from payment partly in return for a monthly subscription determined by

the ministry of health and the system relies on the right of citizens to access health services and that the task of every citizen is interdependence in the receiving the health services, health insurance in ministry of health is composed of different insurance types like government employee insurance, workers insurance, student insurance, disability insurance, social insurance, captive insurance, and so on.

4.3 Current Situation for Government Employee Health Insurance System

In the ministry of health, the system of health insurance is working internally by providing all other different ministries and other related committees with filled forms that contain all the information concerning the insured person, this form is provided manually to ministry of health, laws and constraints on this form are checked manually also, the form must provide other documents that allow the person to access the information in the system, each insurance type has its own type of document and must be provided to allow insurance process and produce the insurance card.

4.4 Health Insurance System for Government Employee in E-government Model

In this section we will be concerned in how we could represent the employee government insurance in e-government depending on the basic ideas that is proposed in chapter three, we are going through the details of this type insurance to identify the rules, interoperability, business process and business services, all of these topics need different types of updated technology to give us a full image of how the model proposed is approved and related to the real work of health insurance. The following sections explain and identify how to apply the real work of employee government insurance entity in the model proposed in this thesis.

4.4.1 General Employee Government Health Insurance Stakeholders

Figure (4.1) explains the employee health insurance stakeholders and its work environment, in this environment the E-Gov Bus provides common and standard infrastructure for application connectivity and processes, it works to transform message format between

consumer and provider, route requests to correct service provider, converts transport protocol between consumer and provider, ensure secure communication, supports services oriented architecture, message driven architecture and event driven architecture.

Access Point represents single access point of interaction with external entities, it is able to supply and request services and able to send and receive messages, it works as a bridge between external and internal resources, it uses web services technology; it is software system designed to support interoperable machine interaction over network, it has an interface described in using WSDL using SOAP messages over HTTP With XML.

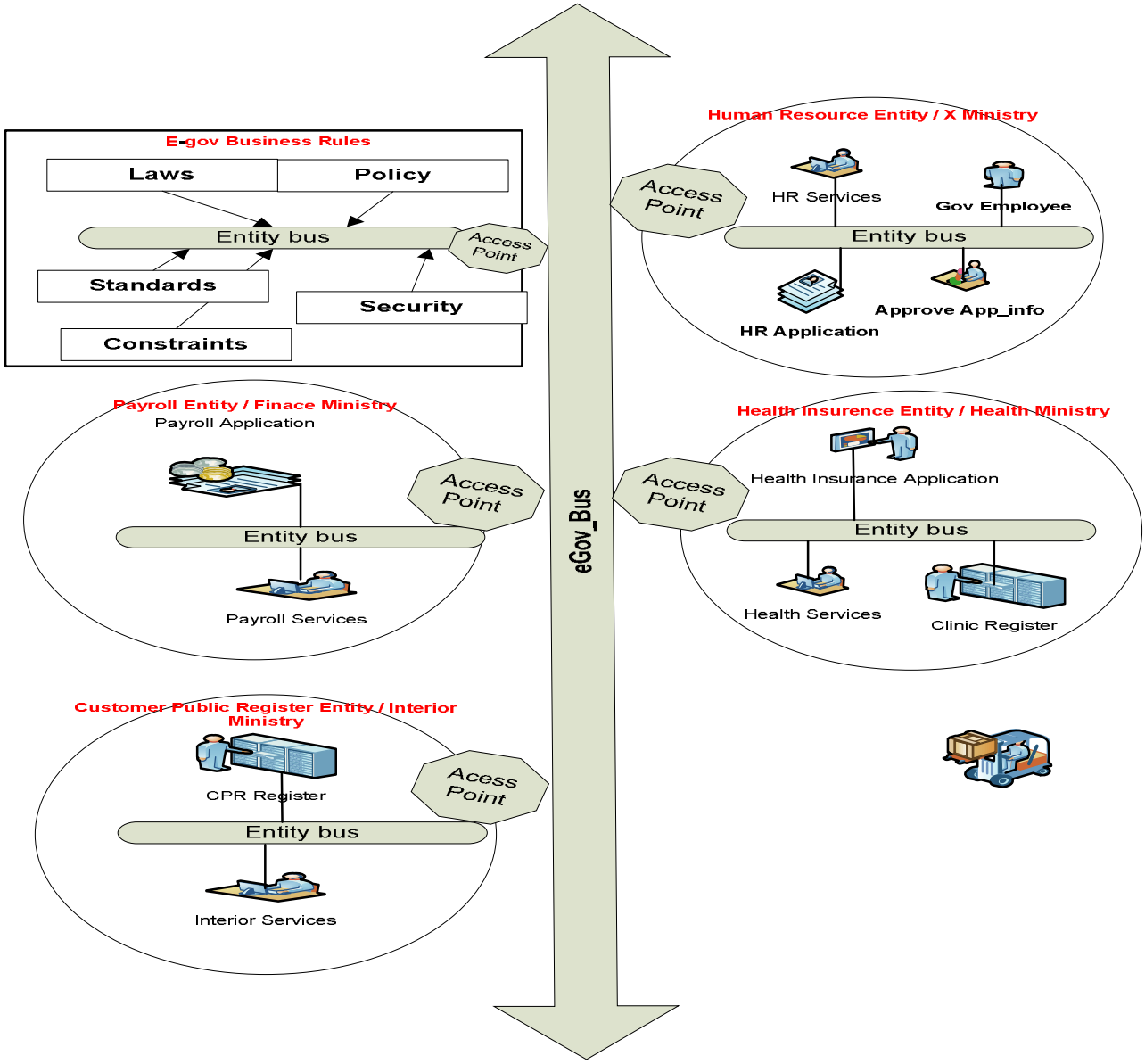

Figure 4.1: Employee Government Health Insurance Stakeholders

Entity Bus allows connection in entity internally, it gives the ability to access legacy database and systems that the entity used, WSDL interface and XML could be used to transform request and response and generate data.

Health Insurance Entity / Health Ministry represents health insurance entity, it concerns with all the interactions and services provided to all customers in different types, which allow all to fill health insurance form, so insurance customer must have the web service needed to provide him with service depending on its type, in our case study the employee is the insurance person, when the employee has a deduction from salary, information transforms from ministry of finance to ministry of health electronically, then ministry of health sends message to the employee through an email or mobile to inform him that he could now fill health insurance form to produce health insurance card, ministry of health may use user name and password to give the employee the ability to register and to facilitate the employee retrievers his/her information is needed to fill the form depending on the employee health insurance constraints, strategy, security, laws and so on.

Human Resources Entity / X Minister concerns with personnel affairs, so it uses its control to audit and prove the employee information filled in health insurance form, just it retrieves and ensures the employee that his/her form is sent and indicates that the employee is an employee in this ministry, and the employee must be provided with a certain time with his/her insurance card dynamically.

Payroll Entity / Finance Ministry calculates employee salary, it concerns with calculation of allowance and deduction of each employee, discount health insurance occurs in this entity, so this entity informs the employee of this discount through messages sent directly to him or through salary slips sent to employee through an email, and also this unit informs the health insurance entity by transforming a monthly discount data to health insurance system.

Public Civil Entity / Interior Ministry concerns with public register (PR) or customer public register (CPR), each customer must have his own user's name and password to be able to use his/her information, in our case the employee has his own user's name and password to retrieve information as a citizen, but when he wants to fill the employee government insurance form he must use his employee ID to control on his/her access in filling information's under the type of government process constraints and laws.

4.4.2 Business Process Services (Central Server)

Through this part of the design we will identify the type of process that the health insurance in the ministry of health must provide, for general use in e-government this part identifies the different types of services that the e-government will supply to the other different parties, but in this part we are focusing on our case study health insurance for employee government, we know the other different types mentioned in the above-mentioned data, so business process definition for our case study contains employee government health insurance.

To manipulate and identify business process in the model proposed we represent it on the central server, the central server allows each ministry or community to announce the services that will be provided, this server uses web service business process execution language (WS_BPEL) to identify employee government health insurance, through this language we identify the relation of this business process service with the other web services (WS) that must be needed to perform its work, messages are transferred from (WS_BPEL) to other web services to request the real application operation to apply the process. It tells the other different external and internal sides about the employee government insurance, WS-BPEL allows identifying the different business process that passes from the external of e-government parties to the internal application or system to manipulate it automatically between different vertical and horizontal hierarchy.

4.4.3 Business Services (Control Server)

Business services in the model proposed identify all the web services that the business process services needed to be done, these services provide the necessary information for the work of business process services, these business services identify the control server, this server will identify all the web services needed to provide the information, it will be ensure the business process service retrieve all the information needed to submit the service to the real application through the mediator for the interoperability to resolve the model proposed, so after the form of the central server completes its own information the control server allows the submission of this form to real health insurance systems to manipulate the government employee health insurance request, in our case study these business services are:

1. **CPR Web Service in Interior Ministry:** it identifies web service to serve the citizen, employee, business, government, it depends on the type of customer and the function needed, here the web service provides employee with information family depending on the constraints of health insurance employee constraints, it does not allow the addition of the father or mother unless they are over 60 years, sons over 18 years are not allowed to remain insured unless there is an evidence showing that the son is a student and or the daughter who is over 18 is not married and so on.
2. **Payroll Web Service in Finance Ministry:** allows employee to retrieve his/her finance information by using user's name and password, this service identifies employee ID, information retrieves about salary, allowance and deduction information.
3. **Clinic Web Service in Health ministry:** from this web service the employee could retrieve the clinic information to identify it in insurance card depending on the employee region and place of residence, employee provide user's name and password

provided to him from interior ministry to retrieve his /her own information and fill it in the health insurance form.

4. **Human Resources in X Ministry:** this web service allows the personnel affairs to retrieve employee health insurance filled form to prove it and submit it to health insurance, the employee may be able to submit it automatically after obtaining an automatic proof and the personnel affairs may be able to give a response to employee after verifying the proof telling him that his/her form is approved or not, the response reaches the employee from the personnel affairs.

4.4.4 Business Rules (E-Gov Server): this server represent the highest level in e-government, each entity must tracks the standards, laws, constraints, policy and security definitions on this server in general to achieve the government governs in general and in common exchange, government must track this server in its process and services like public register, also general definition of the most public process like employee ID format definition, security and different common uses on e-government must be provided through this server.

4.4.5 Interoperability (Adapter Server): when processes and services are performed between different entities and each entity has its own type of definition, interoperability server must be provided to resolve the difference in data and process level, it works like a mediator to allow the different talk with each other, here it is important for legacy database, current systems and data mining, the operation of this server is to adapt each other to perform the request and return the response through messages to middleware part.

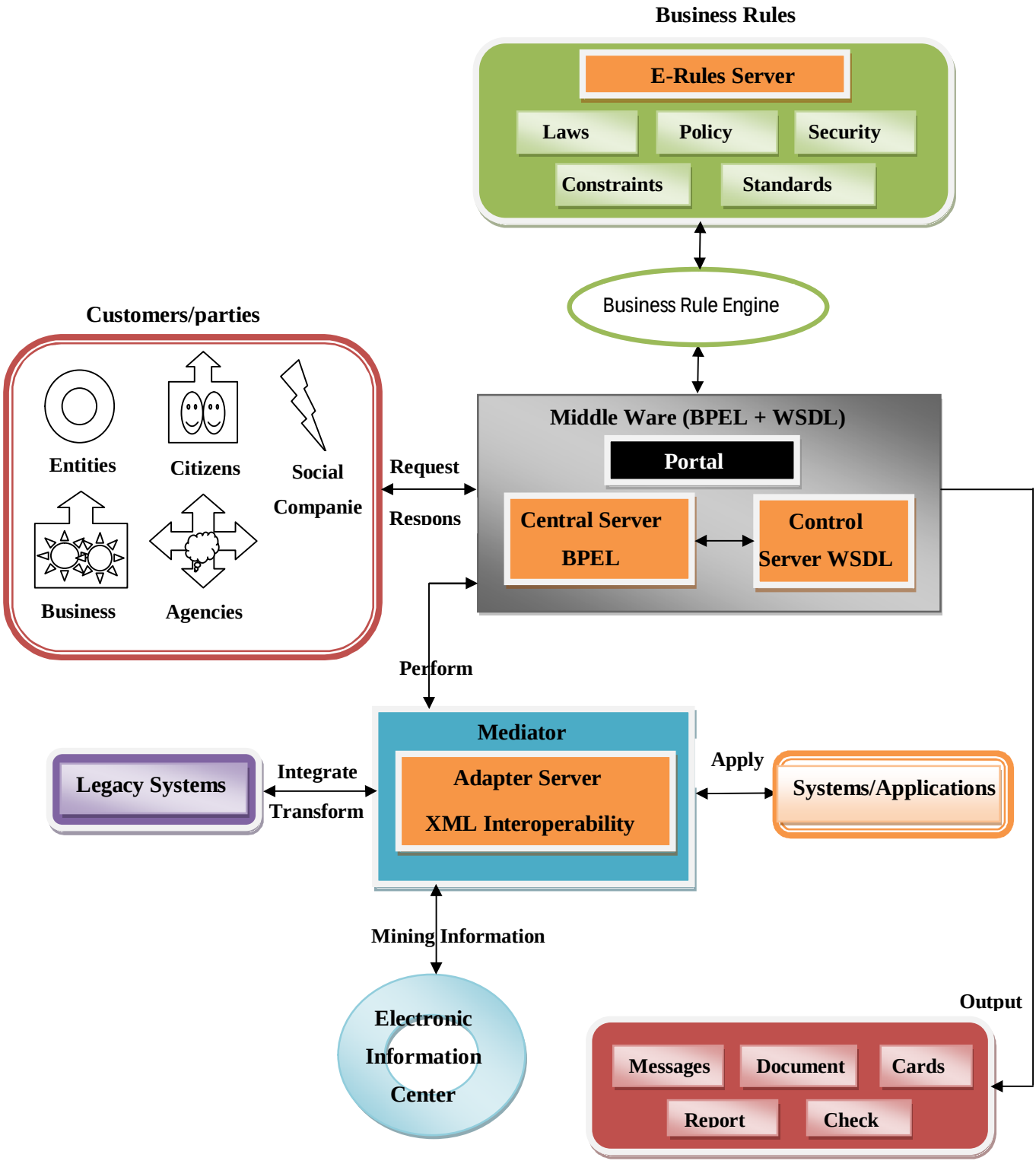

Figure 4.2: Palestinian E-government Model Location Servers

4.4.6 Interface (Portal and Messages): portal represents the main access for different customers, each customer has his/her own services depending on the type, when the customer uses the portal to request service, the connection is transformed or converted to the

server to provide and identify the business service processes, and then the operation is electronically transformed between the different server depending on the path of request and the result returns through the same path.

Here's health insurance service definition in the portal, employee access to use this service in employee health insurance service, this converts the communication to the business process server which identifies the process and requests the control server to identify related services, when the information form is filled, the process is executed by submitting it to health insurance system depending on the adapter server, automation output must be returned to the employee to be informed.

4.5 Health Insurance Palestinian E-government Entity Example

This section represents the general framework in health insurance in ministry of health, this example is shown in Figure (4.3), this figure matches the most important points in health insurance with the model framework architecture and design, and these framework summaries of health insurance information are collected to build different health insurance categories through the model.

4.6 Employee Government Health Insurance Technology Propose

A lot of technology types could be used to apply and execute the employee government health insurance case study, this study could use XML technology to solve a lot of framework problems in interoperability and Business process execution language and WSDL, all of these are used in content XML technology, but in different purposes and in different places in the model as shown in Figure (4.4), JESS technology could be used to execute the run time business rule engine which will be applied in the system run time environment.

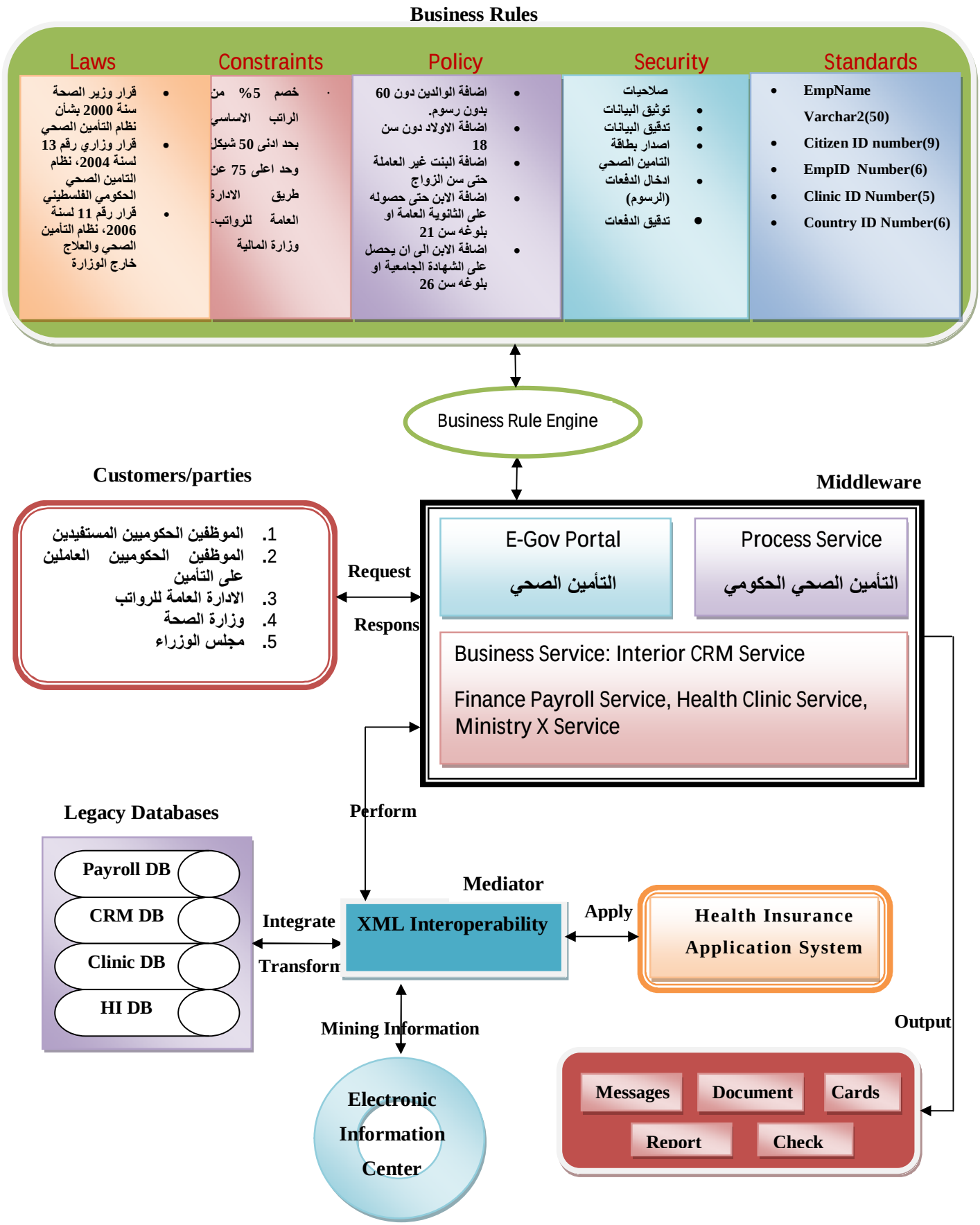

Figure 4.3: Employee Government Health Insurance Example

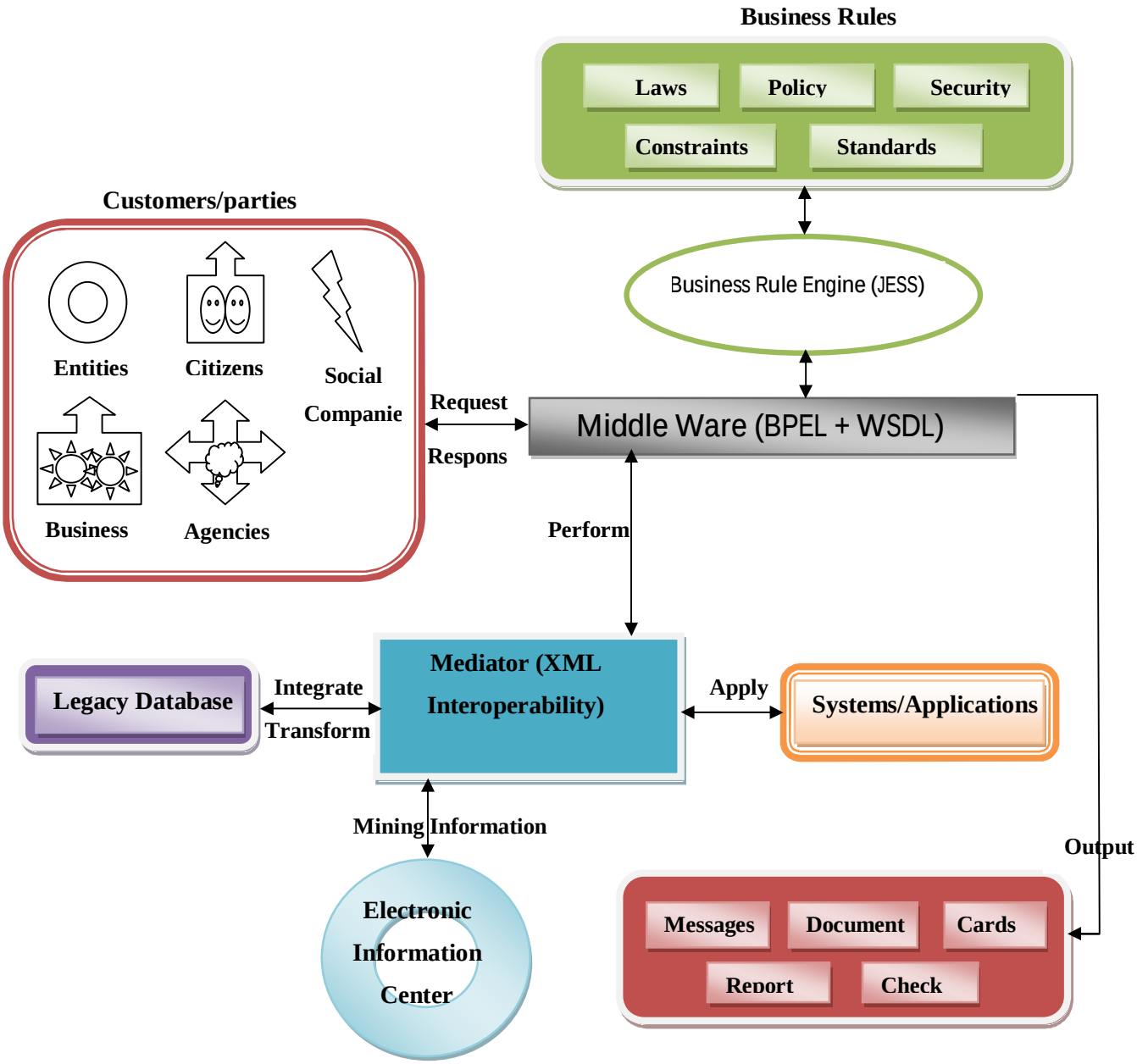

Figure 4.4: Palestinian E-government Model Framework Technology Propose

Chapter Five: Validation and Evaluation

5.1 Introduction

To validate the model test and work, we present the case study discussed in chapter four and divided it into eight phases, each phase represents an important stage work in the form shown in Figure (5.1) manipulation, the form passes input stage, then process and output stages, the result of these stages explains the logistical thinking in proving the model validity. Also section two in this chapter explains the appropriation of the model for generalization, which indicates the availability and the suitability of the model for general government services forms and application, so the model from this validation is suitable to be used for general e-government framework architecture and design.

This chapter providing test case study: Employee health insurance government system, and providing the Generalization: Is the model applicable for all government systems or not?

5.2 Test Case Study: Employee Health Insurance Government System

Through this part we want to apply the application form of health insurance for government employees on the model in this thesis, analyzing the work into phases is necessary to enter the data and procedures of the stage to reach the insurance card.

5.2.1 Phase 1: Application Form

Figure (5.1) below shows the application form used to fill and enter information about different types of government health insurance, different types in health insurance use the same form to fill his/her information in the application, so this form determines the field to identify these types.

5.2.2 Phase 2: Application Form Input

For applying government health insurance, data must be filled depending on the ministry of interior, ministry of finance and ministry of health, so to give employees authority to fill data and register in government health insurance, they should have an employee identity that enables them to request the services of government health insurance. Employee identity shows that this is an employee government and his/her salary is calculated and he/she receives salary slip through email, office and so on, and the discount rate from salary also has been converted monthly from ministry of finance to the revenue ministry of health, so the employee now has the ability to start his/her health insurance registration from the beginning by providing the ministry of health with their information.

So from the portal, when the employee calls the health insurance services, the employee uses employee identity to access health insurance application form which is identified in central server, this server contains the health insurance application form, in this case each one can contact the central server business process depending on the identity code used and identified by the government, there are other types of the health insurance card like student, each student has his/her own identity, because depending on these identity definition business rules server works to provide and support each type depending on its own laws, constraints, policy, standard and constraints.

طلب تسجيل للتأمين الصحي

رقم بطاقة التأمين

1- رقم الهوية

2- تفاصيل عن صاحب التامين

الاسم الاول					اسم الاب							اسم العائلة					اسم الجد		
البلد		العنوان			تاريخ الميلاد							الحالة الشخصية		عدد المرافقين		علامة البلد			علامة المنطقة
العيادة		رمز العيادة			تاريخ بداية التأمين							نوع التامين		جهة التامين		مكان العمل			ختم المكتب
					سنة				شهر			يوم							
																			توقيع الموظف

3- تفاصيل عن المرافقين لصاحب التأمين

متسلسل	الاسم	القرابة	رقم الهوية									تاريخ الميلاد				ملاحظات

اوافق على الانضمام الى نظام التامين الصحي الحكومي واتعهد بالالتزام به

التوقيع ..... التاريخ .....

Figure 5.1: Health Insurance Application Form

5.2.3 Phase 3: Application Form Process

Now employee could call information from ministry of interior by calling the Interior web service defined for health insurance by calling the control server, so each field identified in health insurance application form is identified in a sequence order for business processes in central server, constraints over data entered application, like address field control the clinic place is returned for employee to fill, so to call clinic service from ministry of health the region must be provided and dynamically clinic list returns to allow the selection depending on regional code returned from ministry of interior, also constraints must be allowed to control the relatives who are covered by insurance, like mothers and brothers who must be over 60 years, daughter must have certificate when she is over 18 years to prove that she is not married and the son must be a student if he over 18, there is no problem with the wife, even if he has one or two, these constraints are in sequence on central server in health insurance business service and the request from e-rules server to control business services operation using control server.

Figure (5.2) shows the operation of the process, dotted lines represent sequence; solid arrows represent control links used for synchronization activities.

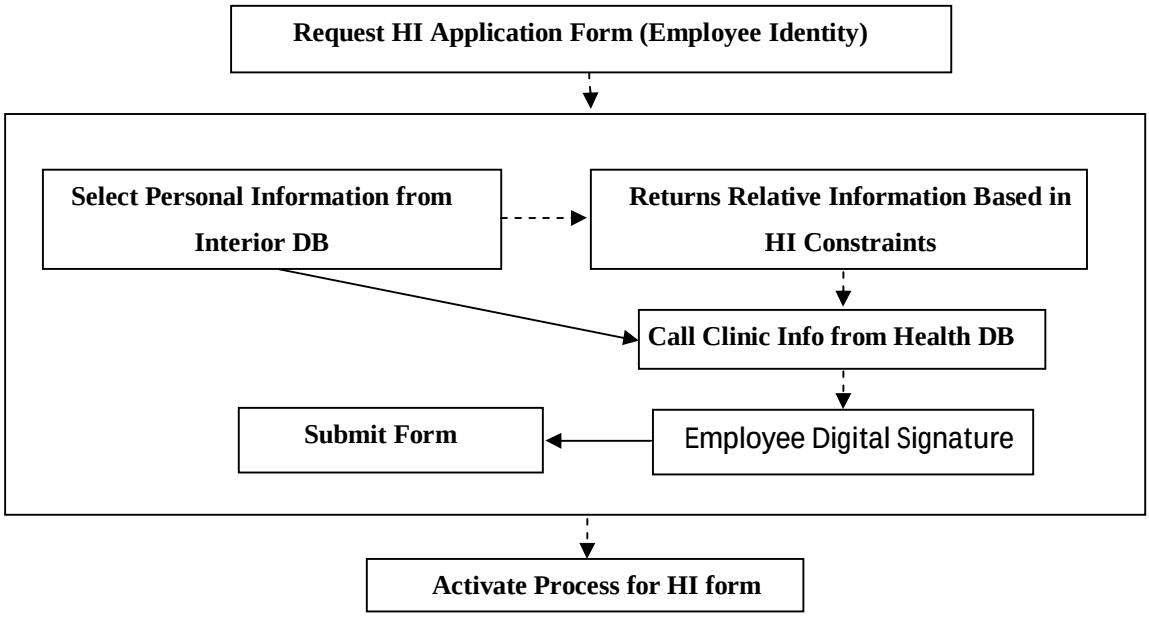

Figure 5.2: Request Application Form Operations Process

5.2.4 Phase 4: Application Form Control

When the application form is requested from the employee, the business process initiates the task, the concurrent sequence operations for filing employee personal information is applied by calling interior web service and selecting the relatives to grant benefits from health insurance related to the control identified. Control and data dependency between the identified tasks allows calling and retrieving clinic places and selecting the most suitable for him, when the task is completed the application form is sent to process in health insurance system. Messages are defined and used to transform between the servers depending on the type of operations performed and the place of the message in each server.

5.2.5 Phase 5: Application Form Rules

This phase manages and controls the whole process over the entire business process request and performs, it represents the admin control over all, it allows changing, inserting, deleting or canceling any rules over the system during its operation, there is no need to stop request for service. By using Business rule engine, the rules are carried out and can create new data, or they can do anything that the programming language can do.

5.2.6 Phase 6: Application Form Adaptation

Legacy database is returned to retrieve application form operations, Interior and health database is retrieved by sending message to adapter server to solve the interoperability problems between the data returned and the data formats are identified in the application form in central server. Process is executed in sequence depending on the messages that come from control server, until the health insurance application executes the health insurance system.

5.2.7 Phase 7: Application Form Output

In this phase, the output comes to health insurance system after the execution occurs in the application form, the output is returned to stakeholder by a defined service that operates to

work when and output returns, by sending a messages to defined place or email or mobile or the employee office, this will happen if the correct steps are completed correctly.

When a mistake occurs through execution, follow up services must be provided to determine the place of problems, it may happened because of data or technical mistake, so admin service follows up the process defined to return the output about each execution stage.

5.2.8 Phase 8: Electronic Center

To get benefit from the accumulated data in legacy database, electronic data center proposes to transform data from operations and legacy database, this allows applying data warehouse process over it and uses data mining model to benefit from the returned knowledge for supporting policy and decision makers.

5.2.9 Previous Phases Requirements

Application form is a process, a process which consist activities, and each activity must identify the standard attributes and standard elements, invoking web service operations, providing web service operations, updating variable contents, follow up signaling faults. Activity flow, pick, semantics, event handlers, concurrency consideration, terminates service instantly.

Structure and lifecycle of a business process consists of partner link types, partner links, and business partners and endpoint references. Messages properties include the motivation, definition and message correlation and events, data handling represents different expressions, error handling and other requirements that must be considered and identified to represent work. Figure (5.3) shows the relationship identified between the approved phases to compose and produce the business process and service.

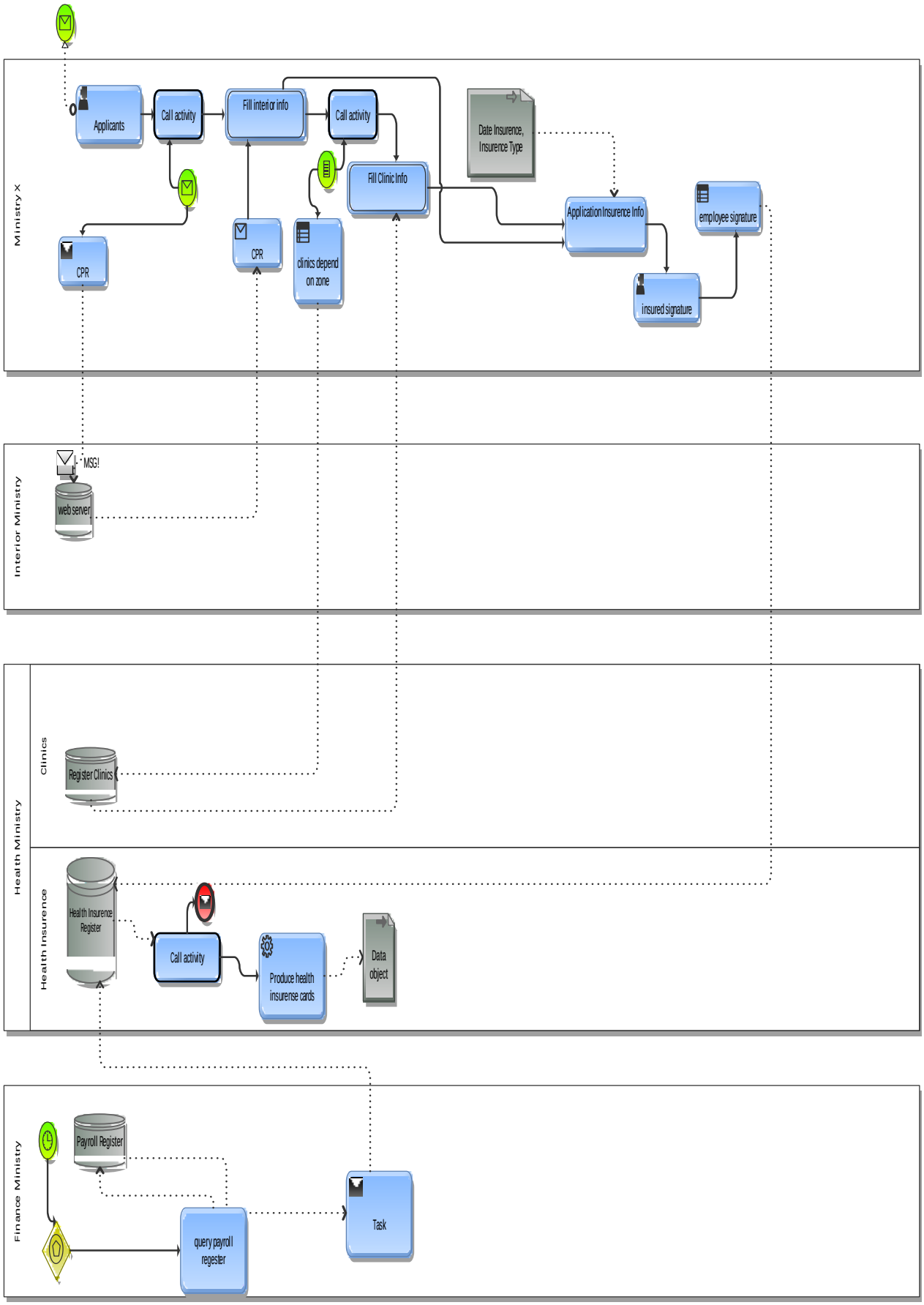

Figure 5.3: Employee Government Health Insurance Business Process Model

5.3 Generalization: Is the Model Applicable for all Government Systems?

For the generalization of the model proposed in thesis, we have done a study on different types of government applications; these applications are in different categories and belong to citizens, business and government.

Every case could be applied in e-government by using this model, through e-government protal we could announce different types of services, each service has its own target, under the services name there are multiple types of service that could be provided, when the service calls the central server to brows the application form, the stakholders fill its information in trust depending on the service requerments that service supports and defines, so central server is a container for the different e-government application form, eack form follows the rule of policy and constarins and web services needs to support its work, controls and adaptation over all is provideed.

Figure (5.4) shows three different users using the portal governmennt to request different types of services, each service is defined on domain of users, so when the user calls or requests the services wanted, she/he must enter the key identified for his/her to allow access, so policy, strategy and security must be applied and identifed to keep privacy of the users and stakholders, output from these different services depends on the service itself, when the users request driver licens appliaction, the output produce a certificate that allow the driver to drive, it must be reliable, driver can recive it from the office or through email, and so on.

The proposed model could be used for common and in general for all the government processes and systems, there are different users, different input and different output related to input and user.

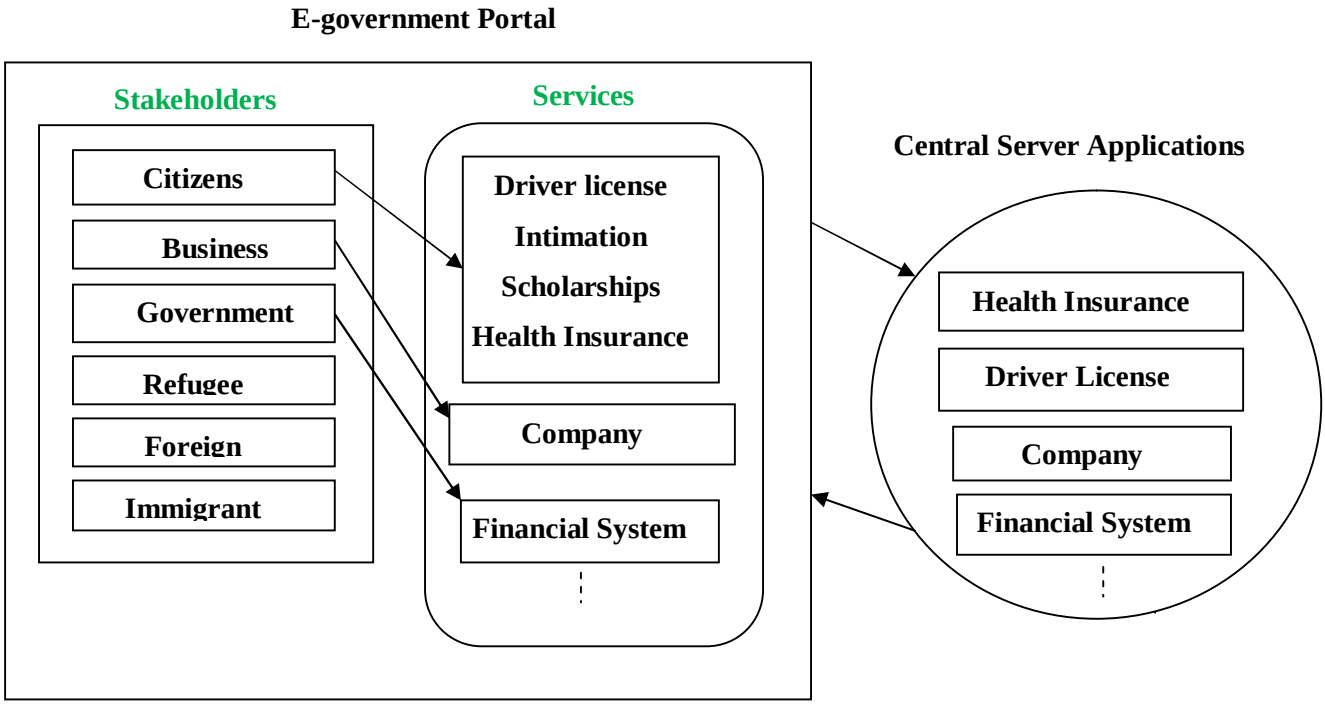

Figure (5.4): Different Users using different E-government Applications

5.4 Employee Health Insurance Case Study Evaluation

This part identified the basic requirements and utilities to evaluate the employee health insurance case study, the requirements represent the online databases used to build health insurance schema, the utilities represent the business rules, classes and the algorithm explains the model workflow, data mining schema extracted from health insurance database to answer some specific questions, in our case study we are taking disease data mining schema for evaluating the future trends of the diseases progressions and management.

5.4.1 Schema

For building employee health insurance schema, we are using specific data that are collected and filled from other online databases, any changing occurred in these data that affect on health insurance database such as employee address will be identified by a web service, when employee address changed, the web service will notify the insurer online about the new list of available clinics in the new address, so to build employee health insurance schema, the employee health insurance calls web services that read data from the following online databases available:

- Interior schema: this schema used to read citizen (here is employee) data and his dependencies, to do that we read (Interior table, Dependency table, dependent type), each table contains:
  - Interior table (identity card, name, birth data, gender, address, marital status, dependent identity cards numbers, region id))
  - Dependency table (dependent identity cards numbers, relation type, gender, address, marital status, birth date)
  - Relation type (relation type, identity card, dependent identity cards numbers)
  - Region (region id, region name)
- Interior table: read employee customer register from Interior data base, these data are (identity card, name, birth data, address, marital status, dependent identity cards numbers)
- Payroll schema(employee number, insurance discount statue)
- General personnel schema or HI DB (employee number, employee status)
- Clinic schema(clinic id, region id, address, telephone)

These data sources used to build health insurance schema, this schema contains the following tables:

- Insurer table (identity card, employee number, insurance type number, insurance card number, mail address)
- Insurance type table (insurance type number, insurance type name)
- Insurer dependents table (insurer identity card, dependent identity card, gender , relation type, birth date)
- Clinic table(clinic id, region id)

The health insurance card number takes its value automatically if all business rules are achieved according to the requested process on the health insurance application.

5.4.2 Business Rules Store Representation

Business rules controls and manages the business processes workflow, for employee health insurance requirements, we need to use the rules to control its operations; in the following tables we identified the rules and its definition:

Security business rules: these rules identified the security of employee number and his identity authentication, its check the validity of employee number and his identity card as in Table (5.1).

Table 5.1: Security Business Rules

Rule "employee number authentication(employee number, employee status)"
For (employee number if exists in general personnel table) and (employee status=valid) then authenticat employee(employee number)
Rule "identity card authentication (identity card)"
For identity card if exists in interior table then authenticate identity card (identity card)

Constraints Business Rules: these rules detects the employee salary status and situation, it check if the employee is still an employee and their salary is discount for health insurance account, as in Table (5.2).

Table 5.2: Constraints Business Rules

Rule "employee insurance discount(employee number, status discount)"
For insurance discount status if [Yes] then discount status=true

Policy Business Rules: these rules determines employee relations, it define the people how could be used the employee insurance cards, as in Table (5.3).

Table 5.3: Policy Business Rules

Rule "Add Dependents (insurer identity card ,dependents[])" as AddDependent[] **è** dependents: identity card gender, relation type, birth date
Case dependent.relation type
Wife: add_wife(dependents.Identity cards)=true
Parent : When (parents>=60) then add parents(dependents.Identity cards)=true
Sun:

```
Case dependents.gender

    Male: then  if ((age(dependents.Identity cards ) <18) or (is_student( dependents.Identity cards )

   and age(identity card)<26)) Then add sun( dependents.Identity cards)

  female  then  if ( age(dependents.Identity cards )<18 )

  or (marital status(age(dependents.Identity cards ))=not married) then add daughter(dependents.Identity cards)

end case

 end case
```

Standard business rules: these rules identify the data type format and structure for the elements fields and messages used to exchange information between different parts in the model proposed, as in Table (5.4).

Table 5.4: Standards Business Rules

```
Rule “employee insurance date format (format)”

For date if dd/mm/rrrr then yes

Rule “employee insurance name format (format)”

For name if length = 50 then yes
```

5.4.3 Classes

Citizens and Clinics classes build to pass the rules parameters and to exchange values of these parameters between the business process and web services and business rules, Table (5.5) explains citizen’s class and Table (5.6) explains clinics classes.

Table 5.5: Citizens Class

```
Class CitizenClass {

Property identity card: number(9)

Property name: String(50)
```

Property birth date: Date

Property address: String(50)

Property marital status: Number(1)

Property gender: Number(1)

Property dependent identity card number: Number(9)

Property region id: Number(4)

Property dependents[] List

Public void setIdentityCard(Number ID) {identity card = ID;}

Public String getIdentityCard () { return identity card;}

Public void setName(String n) {name = n;}

Public String getName() { return name;}

Public void setBirthDate(Date BD) {birth date = BD;}

Public String getBirthDate() { return birth date;}

Public void setAddress(String address) {address = address;}

Public String getAddress() { return address;}

Public void setMaritalStatus(String MS) {marital status = MS;}

Public String getMaritalStatus() { return marital status;}

Public void setGender(String g) {gender = g;}

Public String getGender() { return gender;}

Public void setDependentIdentityCardNumber(Number did) {dependent identity card number = did;}

Public String getDependentIdentityCardNumber () { return dependent identity card number;}

Public void setRegionID(Number rid) {region id = rid;}

Public String getRegionID() { return region id;}

Set<Object> Dependents= new Set<Object>();

Depentents.add(wife);

```
Dependents.add(parents);

Dependents.add(sun);

Dependents.add(daughter);

List<Object> list=new ArrayList<Object>(Dependents);

For (int i=0; I <  list.size(); I++) {

Object o=list.get(I) }

}// end class
```

Table 5.6: Clinics Class

```
Class ClinicsClass {

Property clinic id : number(5)

Property region id: Number(4)

Property name: String(50)

Property address: String(50)

Property telephone: Number(11)

Public void setClinicID(Number CID) {clinic id= CID;}

Public String getClinicID() { return clinic id;}

Public void setName(String n) {name = n;}

Public String getName() { return name;}

Public void setAddress(String address) {address = address;}

Public String getAddress() { return address;}

Public void setTelephone(Number tel) {telephone = tel;}

Public String getTelephone() { return telephone;}

Public void setRegionID(Number rid) {region id = rid;}
```

```
Public String getRegionID() { return region id;} }//end class
```

5.4.4 Web Services: to define the employee health insurance services mentioned through this research, we are using web service to exchange information between different ports, Table (5.7) identify the interior customer register web service.

Table 5.7: Interior Web Service

```
Begin

Dim Citizen as CitizinClass=new CitizinClass(identity card)

//date Format

Dim BRBirthDateFormate as DateFormat

BRBirthDateFormat= Call [BR Employee Insurance Date Format]( Citizen.Birthdate)

If Format ( Citizen.BirthDate) <> BRBirthDateFormat

      Then  Citizen.BirthDate = UpdateFormat( Citizen.BirthDate)

End if

Return  Citizen.BirthDate

End // web service
```

5.4.5 Basic Algorithm Process

This algorithm represents the basic functions and procedures required to execute the employee health insurance case study, after the citizen access e-government portal and explore the employee services, and then select the employee health insurance service, the algorithm below works to process this service request.

Table 5.8 : Employee Health Insurance Basic Process Algorithm

```
Import interior

[employee number]= input employee number
```

```
Dim BREmpNoAth as boolean
 BREmpNoAth =Invoke [employee number authentication](employee number)
If (BREmpNoAth) then  // BR employee authentication
[employee identity Card]= input employee card
Dim BRIDCardAth as boolean
BRIDCardAth =Invoke [identity card authentication](employee number)
        If (BRIDCardAth) then  //BR Identity Card Authentication
                //check employee insurance deduction
                Dim BREmpInsDis     as boolean
                BREmpInsDis = call [employee insurance discount] (employee number)
                If (BREmpInsDis) then  // BR Employee Insurance Discount
                        Open_interface[employee health insurance business process]
                        Dim insurer as CitizenClass= new CitezenClass (employee identity Card)
                        Citezen = Call [employee interior web service]( employee identity Card)
                        Dim BRDependent As List of Boolean
                        Dim BRDependent = Call [Dependent Rule]( InsurereClass.Dependent)
                        For i=1 to CitizenClass.Dependent.length
                        Case  BRDependent
                            Wife: Add_Wife_Process()
                            Sun : Add_Sun_Process()
                            Daughter : Add_Daughter_Process()
                            Parents: Add_Parents_Process()
                        End Case
                        Dim Clinics as ClinicsClass = new ClinicClass(Region ID)
                        Clinics = Call [Clinics web service](Region ID)
```

```
                    Dim SubmitDate as Date =Current date

                    Dim InsuranceCardNo as integer

                     InsuranceCardNo= call Generate_Card_No

                    Input EmailAdrress

                    Mail(EmailAdress) : InsuranceCardNo

            Else

                NotificaionMessage("Sorry , your Health Insurance Valid")

            End If  // BR Employee Insurance Discount

    Else

            NotificaionMessage("Sorry , your Identity Card Number is not valid for Employee Insuranc
            Type")

     End if  //BR Identity Card Authentication

Else

   NotificaionMessage("Sorry , make sure that you insert a valid employee number")

End If // BR employee authentication
```

5.4.6 Data Mining Model in Heath Insurance Case Study

In general the data mining process model and techniques apply in electronic data center in the e-government model proposed, data extracted and loaded into data warehouse from different data sources to compose data mining schema, this schema build for answering questions to support decision makers, so by depending on the employee health insurance case study, we suggest some questions to benefit from the accumulated data, these questions like:.

- Discovering disease future trends to enhance the understanding of disease progression and management.
- Recalculated the insurance discount periodically by evaluating the risk cost to manage the health insurance future expenses and revenues.
- Find the profile of the target item like medicine.
- Predict individual behavior for patient depending on disease,

- Calculate health insurance discount by evaluating the risk and the treatment spends
- Medical treatment evaluation.

In this study, we want to discover the diseases future trends to enhance the understanding of disease progression and management for testing the use of data mining process model.

Disease Data Sources

To compose disease data mining schema, we need to identify the data sources that contain related data for evaluating the disease future trends, these data sources schema are:

- Clinic data (clinic id, clinic name, region id)
- Patient data (patient id, clinic id, visit date, cost, name, age, disease id, medicine id, number of visit, insurance card id)
- Diseases data (disease id, disease name, diagnosis id, test id)
- Region data (region name, region id)
- Diagnosis data (diagnosis id, diagnosis name, symptom id)
- medicine data (medicine id, medicine name, cost)
- lab tests data (test id, test name)
- Insurance data (insurance type, insurance card id)
- symptom data(symptom id, symptom name)

Disease data mining schema

To build disease data mining schema, we transformed the data fields related to diseases from data sources and collect it in one diseases table, this table used to evaluate disease trends, Table 5.9 represents diseases data mining fields.

Table 5.9: Diseases Data Mining Fields

Diseases	Region	Clinics	Patient Age	Number of Visits	Visit date	Test	Diagnosis

After these data extracted and transformed from data sources, the loaded data manipulated for removing repeated values to take the accurate data. Then we take key fields to classify these data.

Disease Data Mining Classification

When the disease data mining available, the data classify by using the key fields that lead us to rebuild data evaluation, in this case we are using the region id and the patient age as key

fields to classify disease data mining schema, each region has its own information about based on disease classification, as in Table (5.10), and each age has its own disease information, as in Table (5.11), the value of the number of visits represents, value of tests and diagnosis controls the trend of diseases in this region and age, so in this case the classification data mining technique used to manipulate data to evaluate disease trend. These allow decision makers to have knowledge in what they are doing to solve diseases and the pest solution for protect people in future.

Table 5.10: Diseases Data Mining Region Classification

Diseases	Region1	Region2	Region3	Region4	Clinics	Age	Visits#	Visit date	Test	Diagnosis

Table 5.11: Diseases Data Mining Age Classification

Diseases	Age1	Age2	Age3	Age4	Clinics	region	Visits#	Visit date	Test	Diagnosis

Chapter Six: Conclusion

6.1 Introduction

This chapter summarizes the results and the important points indicated in this research; and how this work contributed in e-government process models and design, also it explores future works that this study produces it for applying and researching.

6.2 Conclusion

From the previous studies that presented and studied in this research, we were able to develop and construct a suitable Palestinian e-government model and design, these studies adapted to fit in our study, now it’s the ability to build and develop e-government basic infrastructure by using information and communication technology in a distinguished way, it's ability to take advantage of the vast amount of accumulated data to support decision and policy development, the model is simple and based to support:

- Re-Building the mechanism of government work.
- Use of ICT development to serve government work.
- Different systems communicate to process regardless of the differences between data type, process and technical (Interoperability).
- Dynamic updates are applying over different type of systems without overlapping.
- Benefits from government accumulated data in studies and decision support.

- Processing the transaction automatically between the parties to ensure fast delivery.
- Find a top root to govern the government for providing governmental standards, policies and constraints, laws and security.
- Integration of data between systems guarantees the accuracy of government data and ease of use and benefit from it.
- Transformation of data to electronic center gives government the power to shape future policies and plans.
- Measuring the performance and effectiveness of government action and ensuring transparency and giving confidence to government work.

6.3 Contribution

This thesis contributes through adding new layer in the previous e-government layers hierarchy, this layer works as the manager and controller layer over all the other layers. It works as a reference for all e-government processes and information as it contains the security, laws, constraints, policy and standards. So the work of this layer represents the e-government, the workers over this layer controls and manages the government policies and decision makers, they are found to help public sector in using and benefit from the development in information communication technology.

Also, this thesis contributes is updating and adapting new e-government process model stages in functional and information integration stages. Functional integration stage is organizing and unifying the work of a government functions to prevent a repetition in the performance of government work. It uses common interference for each function regardless of the differences in horizontal and vertical level in government work hierarchy. The Information integration is using to take advantage from the data distributed in different government databases, these data converted and transferred to the electronic data center in e-government. This allows making the integration between different e-government

responsibilities, also electronic information center allows searching for valuable information to extract knowledge to support the decision makers by identifying Fayyad data mining process model, and so different e-government parties could benefit from this center to support their decisions

These contributions have helped to contribute in constructing and building Palestinian e-government process model and design framework architecture, also the place of Fayyad data mining process model is organizing and identifying in Palestinian e-government to extract knowledge from accumulated data from electronic data center, this center added to transform data from different databases and store it in different dimensions. Middleware used in this design, it contains business process and business services to define the services and web services used to submit the form and complete the operation processes, mediator used in this framework design to solve the interoperability problems and allow the conversations between different levels of requirements as a technical, data and process level.

So this thesis contributed in identifying and constructing a simple Palestinian e-government process model and design framework architecture and organize Fayyad data mining model in this framework architecture design.

6.4 Future Work

This study indicates too many points of research and applications in the field of e-government and data mining, it draws the map needed to perform our work and distributed the government loads in appropriateness, so the researcher can take interested in:

1. Applying the health insurance case study analysis and studies in research,
2. Each entity in the government can apply and develop through this model proposal
3. Searching the best way to communicate between central and control server.

4. Searching the suitable for interoperability (adapter server) at different levels and contents, which means that the researcher could search data interoperability in data, process and technical level in e-government environment,
5. Security mechanisms to support e-government environment.
6. The way of building Standards for sharing common e-government platforms.
7. Applying data mining techniques in e-government environment.
8. Development using business rule engine ability to interact with new way for building enterprise applications.

References

1. Is E-Government Ready for Prime Time?, (2007), IEEE, Stephen Ruth • ruth@gmu.edu.
2. A strategy-based model for e-government planning, (2007), IEEE Xplore, Kolsoom Abbasi Shahkooh . Ali Abdollahi.
3. A Review of Data Mining Techniques, (2001), Emerald, Sang Jun Lee. Kang Siau.
4. Developing Generic Shared Services for e-Government, (2004), ejeg, Marijn Janssen and René agenaar.
5. E–government for Developing Countries: Opportunities and Challenges, (2004), EJISDC, Valentina (Dardha) Ndou.
6. Advancing Knowledge Discovery and Data Mining, (2008), IEEE Xplore, Qi Luo.
7. From Data Mining to Knowledge Discovery in Databases, (1996), AI MAGAZINE, Usama Fayyad.
8. Data Mining Applications in Public Organizations, (2008), IEEE Xplore, Mirjana PejiC Bach Faculty of Economics, University of Zugreb Trg J.F. Kennedya 6, 10000 Zagreb, Croatia.
9. Educational Data Mining: A survey from 1995 to 2005, (2006), Elsevier, C. Romero *, S. Ventura.
10. Data Mining Techniques for the Detection of Fraudulent Financial Statements, (2006), Elsevier, Efstathios Kirkos a,1, Charalambos Spathis b,*, Yannis Manolopoulos
11. Mining Typical Patterns from Databases, (2008), Elsevier, Hui-Ling Hua, Yen-Liang Chen.
12. A Search Space Reduction Methodology for Data Mining in Large Databases, (2008), Elsevier, Angel Kuri-Morales a, Fa´tima Rodrı´guez-Erazo.
13. Breaking Out of the Black-Box: Research Challenges in Data Mining, Padhraic Smyth Information and Computer Science University of California, Irvine CA 92697{3425 smyth@ics.uci.edu.
14. Ten Emerging E-government Challenges Today, (2006), 4th International Conference on E-governance Keynote Session: E-gov Brass Tacks, Dr D.C.Misra Independent E-government Consultant New Delhi, India.
15. Models for E-government, (2007), Emerald, Paul Beynon-Davies, Cardiff Business School, Cardiff University, Cardiff, UK.
16. A Proposed Model for E-government Maturity, (2008), IEEE Xplore, Kolsoom Abbasi Shahkooh . Fatemeh Saghafi . Ali Abdollahi.
17. E-government Adoption: Architecture and Barriers, (2005), Emerald, Zakareya Ebrahim and Zahir Irani.
18. Federation of E-government: A Model and Framework, (2007), ISACA, Abdelbaset Rabaiah and Eddy Vandijck.
19. A Composite Domain Framework for Developing Electronic Public Services, (2007), UNU-IIST, Adegboyega Ojo, Tomasz Janowski and Elsa Estevez.

20. Current and Future use of New Technology in Human Resources Management in European Public Administrations, (2003), 41TH metting of the European irectors-general responsible for public administration, Andrea Tabladini (KPMG Business Advisory Services), Giancarlo Capitani (NetConsulting) and Roberto Gatti (Nolan Norton Italia).

21. A survey of Knowledge Discovery and Data Mining Process Models, (2006), The Knowledge Engineering Review, Cambridge University, LUKASZ A. KURGAN . PETR MUSILEK.

22. Top 10 Algorithms in Data Mining, (2007), Springer, Xindong Wu . Vipin Kumar . J.Ross Quinlan . Joydeep Ghosh . Qiang Yang . Hiroshi Motoda . Geoffrey J.McLachlan . Angus Ng . Bing Liu . Philip S. Yu . Zhi-Hua Zhou . Michael Steinbach . David J. Hand . Dan Steinberg.

Appendixes

A: Form (1.1): Collect Information Form

استمارة جمع بيانات المعاملة الحكومية الفلسطينية "دليل عمل المعاملة الحكومية الفلسطينية"

تنقيب البيانات في الحكومة الالكترونية: تصميم حكومة الكترونية فلسطينية وتمييز نموذج التعدين المناسب

إشراف: الدكتور بديع السرطاوي

إعداد الطالبة: خلود الطويل

1. **اسم الوزارة / المؤسسة:** _____
2. **رقم الوزارة / المؤسسة (إن وجد):** _____
3. **عنوان الوزارة:** _____
4. **رقم المنطقة (ان وجد):** _____
5. **نوع المعاملة:** _____
6. **رقم نوع المعاملة (إن وجد):** _____
7. **تصنيف المعاملة:** _____
8. **رقم تصنيف المعاملة (إن وجد):** _____
9. **وصف القانون الذي تعمل عليه المعاملة:** _____
10. **اسم القانون الذي تعمل عليه المعاملة:** _____
11. **رقم القانون (ان وجد):** _____
12. **موضوع المعاملة:** أ . مالية ب. اجتماعية ج. تربية وتعليم د. تجارية ه. اقتصادية و. صحية
13. **الحركات التي تتم على المعاملة:** أ. جديدة ب. تجديد ج. تمديد ء. تعديل ه. الغاء و. اخرى (حدد) د. أخرى (حدد)_____
14. **مراحل تنفيذ المعاملة:** أ. تم استلامها ب. في الاجراءات ج. غير مكتملة د. ملغية ه. في التدقيق و. تم اعتمادها ع. قيد التنفيذ غ. أخرى (حدد) _____
15. **المدة الزمنية المتوقعة لانجاز المعاملة:** من:_____ الى:_____

16. **مكان تقديم المعاملة:** أ . المركز الرئيسي ب. المكاتب الفرعية ج. البريد
د. أخرى (حدد)_____

17. **مكان استلام المعاملة:** أ . المركز الرئيسي ب. المكاتب الفرعية ج. البريد
د. أخرى (حدد)_____

18. **الجهة المستفيدة من المعاملة:** أ . خاصة بالمؤسسة ب. خاص بالمستفيد

19. **نوع المستفيد:** أ . مؤسسة ب. مواطن ج. رجال اعمال

20. **تكلفة المعاملة:** أ . مجاني ب. برسوم (حدد) _____

21. **عملة دفع الرسوم:** أ. شيكل ب. دينار ج. دولار د. يورو ه. اخرى(حدد)_____

22. **طريقة دفع الرسوم للمعاملة:** أ . نقدي داخل المؤسسة ب. البنك ج . طوابع د. شيك ه. حوالة و. البريد
ع. اخرى(حدد) _____

23. **كيف تتم معالجة المعاملة حاليا:** أ. ورقيا وتحفظ في ملف ب . تعالج بالبرامج الجاهزة ج. تدخل الى نظام خاصا بها

24. **في حال ان المعاملة محوسبة حاليا هل تعمل على :** **أ.** قاعدة بيانات مركزية (Centralized DB)
ب. قاعدة بيانات محلية (Local DB)
ج. قاعدة بيانات مرتبطة بقاعدة بيانات اخرى (Distributed DB)

25. **الوثائق الرسمية اللازمة لاستكمال تقديم المعاملة (متطلبات سابقة) / المعاملات التي تعتمد عليها المعاملة**

رقم الوزارة / المؤسسة	من الوزارة / المؤسسة	رقم المعاملة / الوثيقة	نوع الوثيقة / المعاملة	نوع المؤسسة	
				حكومية	غير حكومية

26. **التسلسل الاجرائي الذي يتم على المعاملة من البداية الى النهاية وعلاقتها بالمؤسسات الاخرى ان وجدت**

رقم الوزارة / المؤسسة	اسم الوزارة / المؤسسة	التسلسل الإجرائي	نوع الموافقة	نوع المؤسسة	
				حكومي	غير حكومي

27. **القيود على المعاملة:**

الرقم	تصنيف القيد	نوع القيد

21. المؤسسات المهتمة بالمعلومات الواردة بالمعاملة

رقم المؤسسة /الوزارة	اسم المؤسسة/ الوزارة	نوع المؤسسة		طبيعة الاهتمام
		حكومية	غير حكومية	

22. اقتراحات تسريع انجاز تنفيذ المعاملة

رقم الوزارة / المؤسسة	اسم الوزارة / المؤسسة	الاقتراح

الرجاء ارفاق التالي:

1. ارفاق تعليمات النموذجيه لتقديم المعاملة .
2. ارفاق نموذج المعاملة .
3. ارفاق نموذج عن الوثائق المطلوبة .
4. ارفاق التسلسل الاجرائي لتنفيذ وانجاز المعاملة.
5. ارفاق القوانين واللوائح التي تعمل عليها المعاملة.

B: Abbreviations Definition

Abbreviation	Term	Definition	Page
KDDM	Knowledge Discovery and Data Mining	Is the process of analyzing data from different perspectives and summarizing it into useful information	3,17
EGE	E-government Entity	It represents autonomous government operations, messages and interfaces using to interact with other e-government entities or any other framework components.	31
GIF	Government Interoperability Framework	It's the ability of citizens and government agencies to work together in data, process and technical levels.	38
WSDL	Web Service Definition Language	Is an XML based language for describing Web services and how to access them	44
SOAP	Service Oriented Architecture Protocol	SOAP is a simple XML based protocol to let applications exchange information over HTTP	44
CPR	Customer Pubic register	Represent Citizens data set return from Interior Ministry	45
WS-BPEL	Web Service- Business Process Execution Language-	Define for specifying business process behavior based on Web Services.	45
JESS	Java Engine	Jess is a rule engine and scripting environment written entirely in Sun's java language	51